

# **EXHIBIT 11**

PTO/SB/08A (09-06)

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Application Number	09/657,181
Filing Date	September 7, 2000
First Named Inventor	Scott A. MOSKOWITZ et al.
Art Unit	2857
Examiner Name	NA
Attorney Docket Number	80408.0012

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-4,939,515	07/03/1990	Adelson	
		US-5,161,210	11/03/1992	Druyvesteyn,et.al.	
		US-5,450,490	09/12/1995	Jensen et.al.	
		US-5,530,751	06/25/1996	Morris	
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		US-5,721,788	02/24/1998	Powell et.al.	
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		US-5,912,972	06/15/1999	Barton	
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		US-5,748,783	05/05/1998	Rhoads	
		US-6,330,672	12/11/2001	Shur	
		US-5,243,423	09/07/1993	DeJean et.al.	
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FOREIGN PATENT DOCUMENTS					
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		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)			T <sup>6</sup>
		European Patent No. EP0565947A1	10/20/1993	Kuusama, Juha	
		WO 95/14289	05/26/1995	Rhoads, Geoffrey	
		European Patent No. 0581317A2	02/02/1994	Powell, Robert et.al.	
		European Patent No. 0372601A1	06/13/1990	Druyvesteyn, Wm. et.al.	
		W098/37513	08/27/1998	Biggar, Michael et.al.	
		European Patent No. 0651554A	05/03/1995	Eastman Kodak Co.	

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Art Unit

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		US-4,748,668	05/31/1998	Shamir, et.al.	
		US-4,789,928	12/06/1988	Fujisaki	
		US-4,908,873	03/13/1990	Philibert, et.al.	
		US-4,980,782	12/25/1990	Ginkel	
		US-5,073,925	12/17/1991	Nagata, et.al.	
		US-5,243,515	09/07/1993	Lee	
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		US-5,428,606	06/27/1995	Moskowitz	
		US-5,365,586	11/15/1994	Indeck, et.al.	
		US-5,394,324	02/28/1995	Clearwater	
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		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> ( <i>if known</i> )				
		WO 99/62044	12/02/1999	Handel, Theodore et.al		
		WIPO 96/29795	09/26/1996	Micali		
		WIPO 97/24833	07/10/1997	Micali		
		EP 0649261	04/19/1995	Enari		
		NL 100523	09/1998			

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Examiner Name	NA
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		US-4,528,588	07/09/1985	Lofberg	
		US-5,832,119	11/03/1998	Rhoads	
		US-5,859,920	01/12/1999	Daly et.al	
		US-4,979,210	12/18/1990	Nagata et.al	
		US-5,774,452	06/30/1998	Wolosewicz	
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		US-3,986,624	10/19/1976	Cates Jr. et.al	
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		US-5,568,570	10/22/1996	Rabbani	
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		WO 9744736	11/27/1997	Wehrenberg		
		WO 9952271	10/14/1999	Moskowitz		
		WO 9963443	12/09/1999	Ho, Anthony Tung Shuen		

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		US-5,640,569	06/17/1997	Miller, et.al.	
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		US-5,734,752	03/31/1998	Knox	
		US-5,745,569	04/28/1998	Moskowitz, et.al	
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		US-6,425,081	07/23/2002	wamura	
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		US-6,522,769	02/18/2003	Rhoads, et.al.	
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		US-6,754,822	06/22/2004	Zhao	
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		US-7,058,570	06/06/2006	Yu, et.al.	
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Application Number	09/657,181
Filing Date	September 7, 2000
First Named Inventor	Scott A. MOSKOWITZ et al.
Art Unit	2857
Examiner Name	NA
Attorney Docket Number	80408.0012

<b>U. S. PATENT DOCUMENTS</b>				
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
Number-Kind Code <sup>2</sup> ( <i>if known</i> )				
		US-6,061,793	05/09/2000	Tewfik, et.al
		US-5,809,139	09/15/1998	Grirod, et.al.
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Attorney Docket Number	80408.0012

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September 7, 2000

Scott A. MOSKOWITZ et al.

2857

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		Attorney Docket Number	80408.0012
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United States Patent [19]  
Cassada

[11] 3,947,825  
[45] Mar. 30, 1976

[54] ABSTRACTING SYSTEM FOR INDEX SEARCH MACHINE

[75] Inventor: Thomas Edward Cassada, Lexington, Ky.

[73] Assignee: International Business Machines Corporation, Armonk, N.Y.

[22] Filed: May 7, 1975

[21] Appl. No.: 575,318

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 350,880, April 13, 1973, which is a continuation-in-part of Ser. No. 157,565, June 28, 1971.

[52] U.S. Cl. .... 340/172.5

[51] Int. Cl. .... G06F 1/00

[58] Field of Search ..... 340/172.5; 197/19; 271/9

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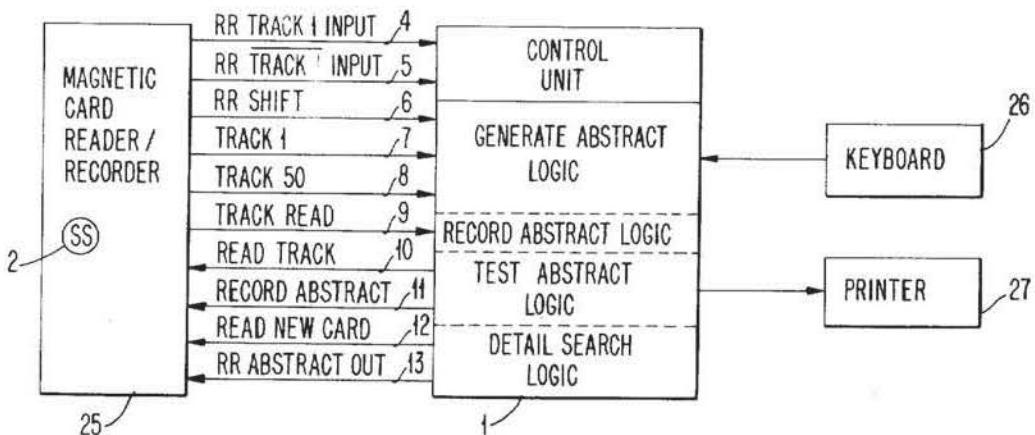
Primary Examiner—Raulfe B. Zache  
Attorney, Agent, or Firm—D. Kendall Cooper

[57] ABSTRACT

The invention concerns a system of English language abstracting used to increase the search rate for an Index Search machine that, as an example makes use of magnetic record cards each having in a typical case 50 tracks for recording of information. To increase the rate at which groups of words can be compared, an abstract of each group of words is generated. On the magnetic card the text or groups of words are recorded on tracks 2 through 50 and the abstracts of these groups are recorded in track 1. When searching for a particular group of words, an abstract is generated for the group being sought. This abstract is then compared to the abstracts on track 1 of each card. If any of the abstracts match, the corresponding group of words on the card are searched in detail. For abstracts that do not match there is no need to search the corresponding group of words. Therefore, the need to search every group of words is eliminated, thus increasing the search rate.

The abstracts are generated from the first and third characters of each word in the group of words. Each character to be used in the generation of the abstract is encoded into one of three groups which are equally probable over the distribution of characters in the English Language. The abstract for a group of words consists of the number of characters that fall in each of the three groups.

57 Claims, 34 Drawing Figures



United States Patent [19]  
Waggener

[11] 3,984,624  
[45] Oct. 5, 1976

[54] VIDEO SYSTEM FOR CONVEYING  
DIGITAL AND ANALOG INFORMATION

[75] Inventor: William N. Waggener, Sarasota, Fla.

[73] Assignee: Weston Instruments, Inc., Newark,  
N.J.

[22] Filed: July 25, 1974

[21] Appl. No.: 491,628

[52] U.S. Cl..... 178/5.6; 178/DIG. 23;  
178/5.8 R

[51] Int. Cl.<sup>2</sup>..... H04N 7/08

[58] Field of Search..... 178/5.6, DIG. 23, 5.8 R;  
179/15 BY, 15 BW, 15 BM

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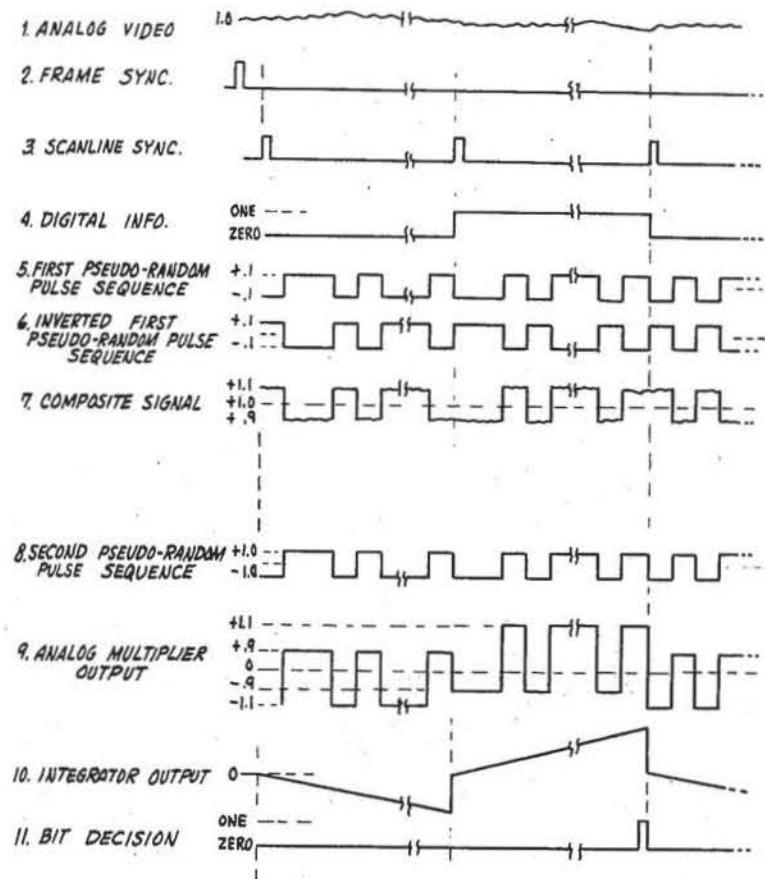
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3,842,196	10/1974	Loughlin.....	179/15 BM
3,870,828	3/1975	Saliga .....	179/15 BY

Primary Examiner—John C. Martin  
Attorney, Agent, or Firm—William R. Sherman; Kevin  
McMahon; I. Kavrukov

[57] ABSTRACT

A video system having a transmitter in which a composite signal is formed by combining digital information with scanlines of an analog video signal generated by a line scanning device, and a receiver in which the digital information is recovered. The digital information is combined with the analog video signal at predetermined locations along scanlines of the video signal, and these predetermined locations are varied in order to prevent visible deterioration of the video image. In the video receiver, the digital information is recovered by examining the composite signal at the predetermined locations to extract the digital information. Each bit of digital information to be conveyed is represented by a first pseudo-random digital pulse sequence (or its complement, depending on whether the data bit is 1 or 0) which is superimposed on a selected scanline of the analog video signal to form the composite signal. The digital information is recovered at the receiver by generating a second pseudo-random digital pulse sequence in synchronism with the first sequence, and by examining the composite signal at locations determined by the second digital pulse sequence to extract the digital information contained in the composite signal.

51 Claims, 5 Drawing Figures



United States Patent [19]  
Adelson

[11] Patent Number: 4,939,515  
[45] Date of Patent: Jul. 3, 1990

[54] DIGITAL SIGNAL ENCODING AND DECODING APPARATUS

[75] Inventor: Edward H. Adelson, Cambridge, Mass.

[73] Assignee: General Electric Company, Princeton, N.J.

[21] Appl. No.: 252,223

[22] Filed: Sep. 30, 1988

[51] Int. Cl.<sup>5</sup> H03M 7/00; H04N 11/04

[52] U.S. Cl. 341/51; 358/13

[58] Field of Search 341/51, 87; 360/32; 358/12, 13

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Primary Examiner—William M. Shoop, Jr.

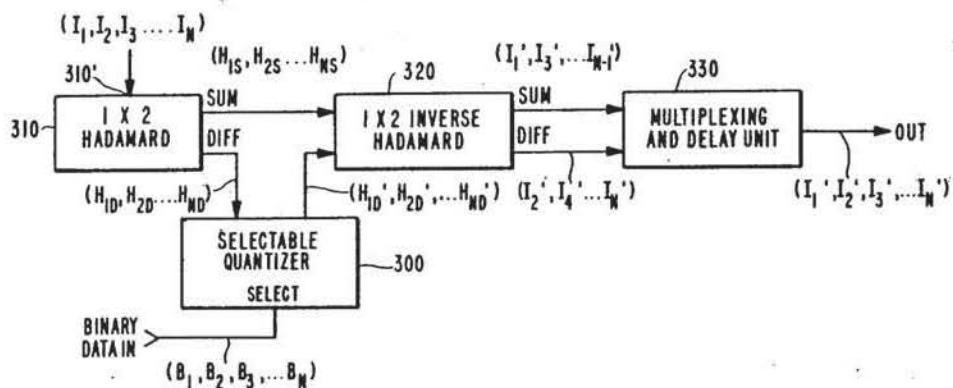
Assistant Examiner—Sharon D. Logan

Attorney, Agent, or Firm—Joseph S. Tripoli; Peter M. Emanuel; Thomas F. Lenihan

[57] ABSTRACT

Digital data is conveyed along with the analog signal by selectively quantizing the analog signal in response to the level of each of the digital bits to be sent. By determining which quantization function was used, a decoder may recover the embedded digital data.

7 Claims, 8 Drawing Sheets



# United States Patent [19]

Silverman et al.

[11] Patent Number: 5,077,665

[45] Date of Patent: Dec. 31, 1991

## [54] DISTRIBUTED MATCHING SYSTEM

[75] Inventors: David L. Silverman, Nesconset; Alfred H. Scholdorf, Port Jefferson Station; Norman Keller, Mt. Sinai, all of N.Y.

[73] Assignee: Reuters Limited, England

[21] Appl. No.: 357,036

[22] Filed: May 25, 1989

[51] Int. Cl.<sup>5</sup> G06F 15/20

[52] U.S. Cl. 364/408; 364/401

[58] Field of Search 364/408, 401, 514

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4,868,866	9/1989	Williams, Jr.	.....	380/49

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1489573	10/1977	United Kingdom	.....	364/408

Primary Examiner—Jerry Smith

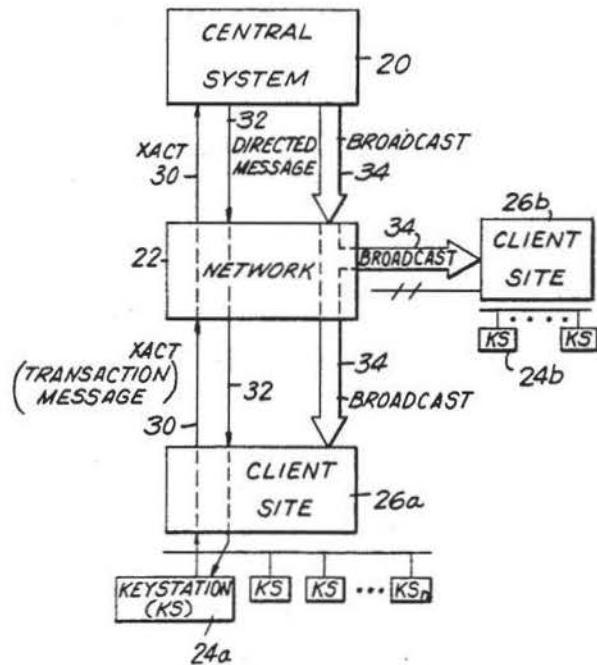
Assistant Examiner—Russell E. Cass

Attorney, Agent, or Firm—Bryan, Cave, McPheevers & McRoberts

## [57] ABSTRACT

A matching system for trading instruments is provided in which bids are automatically matched against offers

57 Claims, 13 Drawing Sheets



for given trading instruments for automatically providing matching transactions in order to complete trades for the given trading instruments in which controllable subsets (110, 112) of a distributable system trading book (118) may be selectively provided to trading keystations (24) in the matching system from the host computer (20) or central system for dynamically controllably masking the available trading market. The system comprises the host computer (20) for maintaining a host book data base (118) comprising all of the active bids and offers in the system by trading instrument, a transaction originating keystone (24a) at a client site (26) for providing a bid on a given trading instrument to the system for providing a potential matching transaction, a counterparty keystone (24b) for providing an offer on the given trading instrument involved in the potential matching transaction, and a network (22) for interconnecting the host computer (20), the transaction originating keystone (24a) and the counterparty keystone (24b) in the system for enabling data communication therebetween. Both the transaction originating keystone (24a) and the counterparty keystone (24b) each have an associated local data base keystone book (110, 112) comprising a subset of the host book (118). The content of each of the keystone books (110, 112) has an associated display depth range which is dynamically controllable by the host computer (20) and is dynamically updatable by transaction update broadcast messages (132) received from the host computer (20) through the network (22) which is preferably transparent to the transactions communicated.



US005136581A

**United States Patent [19]**  
**Muehrcke**

[11] **Patent Number:** **5,136,581**  
[45] **Date of Patent:** **Aug. 4, 1992**

[54] **ARRANGEMENT FOR RESERVING AND ALLOCATING A PLURALITY OF COMPETING DEMANDS FOR AN ORDERED BUS COMMUNICATION NETWORK**

[75] **Inventor:** Eric B. Muehrcke, Middletown, N.J.

[73] **Assignee:** AT&T Bell Laboratories, Murray Hill, N.J.

[21] **Appl. No.:** 546,954

[22] **Filed:** Jul. 2, 1990

[51] **Int. Cl.:** H04Q 11/04; H04M 3/42

[52] **U.S. Cl.:** 370/62; 370/58.1; 370/85.2; 379/54; 379/202; 379/206

[58] **Field of Search:** 370/53, 54, 58.1, 58.2, 370/58.3, 85.1, 85.9, 85.13, 85.14, 62, 85.2; 379/27, 29, 88, 89, 90, 93, 94, 157, 158, 201, 202, 204, 205, 206, 53, 54; 358/85; 364/138, 148, 513, 550

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*Primary Examiner*—Douglas W. Olms

*Assistant Examiner*—Alpus H. Hsu

*Attorney, Agent, or Firm*—B. H. Freedman

[57] **ABSTRACT**

A method and system for allocating a constrained common resource (such as capacity in an ordered bus network) among a plurality of demands for the resource. The allocation arrangement receives from a source, demands for allocating the resource (network) for a particular use, e.g., a conference among a plurality of customer sites, stratifies the received demands in response to a grouping of endpoints to be conferenced at the customer sites, and allocates the network resources to connect the endpoints to be conferenced in response to the stratified demand. This is done by generating setup and terminate times for each endpoint to be connected in a conference; reserving the endpoints to be connected in the conference; and generating a plurality of bindings for signalling the network and the source as to the success of connecting the endpoints to be conferenced over the ordered bus network. The arrangement also stratifies a customer's demand into sets of strategies for groupings of like endpoints; allocates network resources responsive to characteristics of the different groupings of like endpoints; for each strategy, generates the setup times and terminate times for each endpoint, reserves the endpoints for a reservation, and generates bindings. The endpoints may be codecs, alternate accesses, offnets, audio bridges, and/or video conference controllers.

28 Claims, 6 Drawing Sheets

US005394324A

**United States Patent [19]**  
**Clearwater**

[11] Patent Number: **5,394,324**  
[45] Date of Patent: **Feb. 28, 1995**

[54] AUCTION-BASED CONTROL SYSTEM FOR ENERGY RESOURCE MANAGEMENT IN A BUILDING

[75] Inventor: Scott H. Clearwater, Woodside, Calif.

[73] Assignee: Xerox Corporation, Stamford, Conn.

[21] Appl. No.: 163,061

[22] Filed: Dec. 8, 1993

[51] Int. Cl.<sup>6</sup> ..... G06F 15/20

[52] U.S. Cl. ..... 364/402; 364/464.01; 364/140; 364/141; 364/408

[58] Field of Search ..... 364/402, 464.01, 140, 364/141, 505, 550, 408; 236/1 B; 165/2, 13, 14, 58, 59

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Primary Examiner—Gail O. Hayes

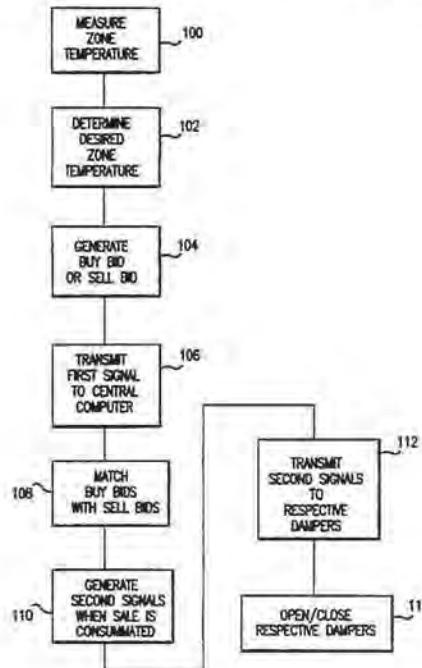
Assistant Examiner—Frantzy Poinvil

Attorney, Agent, or Firm—Oliff & Berridge

[57] ABSTRACT

An auction-based apparatus and method for supplying temperature conditioned air. Each room in an office building makes a bid based on a difference between an actual temperature of the room and a desired temperature of the room. Each room submits the respective bid to a centralized computer that consummates sales based on an auction price. The centralized computer controls the amount of temperature conditioned air supplied to each of the respective rooms based on the consummated sales.

24 Claims, 4 Drawing Sheets





US005379345A

**United States Patent [19]**

Greenberg

[11] Patent Number: 5,379,345

[45] Date of Patent: Jan. 3, 1995

[54] **METHOD AND APPARATUS FOR THE PROCESSING OF ENCODED DATA IN CONJUNCTION WITH AN AUDIO BROADCAST**

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4,805,020	2/1989	Greenberg .....	358/147
4,945,412	7/1990	Kramer .....	358/142
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[75] Inventor: Burton L. Greenberg, New York, N.Y.

Primary Examiner—Bernarr E. Gregory  
Attorney, Agent, or Firm—Schweitzer Cornman & Gross

[73] Assignee: Radio Audit Systems, Inc., Peekskill, N.Y.

[21] Appl. No.: 11,209

[22] Filed: Jan. 29, 1993

[51] Int. Cl.<sup>6</sup> ..... H04L 9/00

[52] U.S. Cl. .... 380/23; 375/1;  
380/6; 380/20; 380/31; 380/34; 380/49;  
340/825.31; 340/825.34

[58] Field of Search ..... 375/1; 380/34, 6, 20,  
380/23, 49, 50, 31, 33; 358/142-147;  
340/825.31, 825.34; 348/461-468, 473-486

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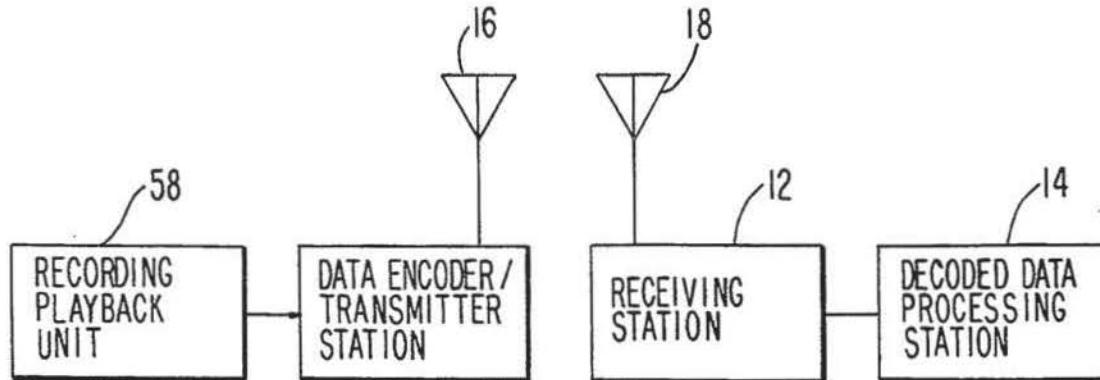
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[57] ABSTRACT

A method and apparatus for the identification and verification of audio transmission segments, such as may be broadcast by a radio station, consists of the generation of a data stream corresponding in duration to the length of the program segment and including both cumulative time data and segment identification data. The data stream is combined with the program segment to which it relates in a manner in which the data is inaudible on conventional reception apparatus and which does not significantly degrade the audio quality of the program segment. A reception facility is provided to extract the data stream from the recorded audio and compare the data therein with reference data for the transmission, including intended length and time of the segment. By such a comparison verification of the broadcast can be accomplished.

16 Claims, 2 Drawing Sheets





US005319735A

**United States Patent [19]**

Preuss et al.

[11] Patent Number: **5,319,735**  
 [45] Date of Patent: **Jun. 7, 1994**

**[54] EMBEDDED SIGNALLING**

[75] Inventors: Robert D. Preuss, Boston, Mass.;  
 Salim E. Roukos, Scarsdale, N.Y.; A.  
 W. F. Huggins, Arlington, Mass.;  
 Herbert Gish, Newton, Mass.;  
 Marcos A. Bergamo, Wellesley,  
 Mass.; Patrick M. Peterson,  
 Cambridge, Mass.; Alan G. Derr,  
 Westford, Mass.

[73] Assignee: Bolt Beranek and Newman Inc.,  
 Cambridge, Mass.

[21] Appl. No.: **808,913**

[22] Filed: **Dec. 17, 1991**

[51] Int. Cl.<sup>5</sup> ..... **G10L 3/00**  
 [52] U.S. Cl. ..... **395/2,14**  
 [58] Field of Search ..... **375/1, 122; 358/143;  
 370/110.1; 395/2, 2.1, 2.14; 381/29-40**

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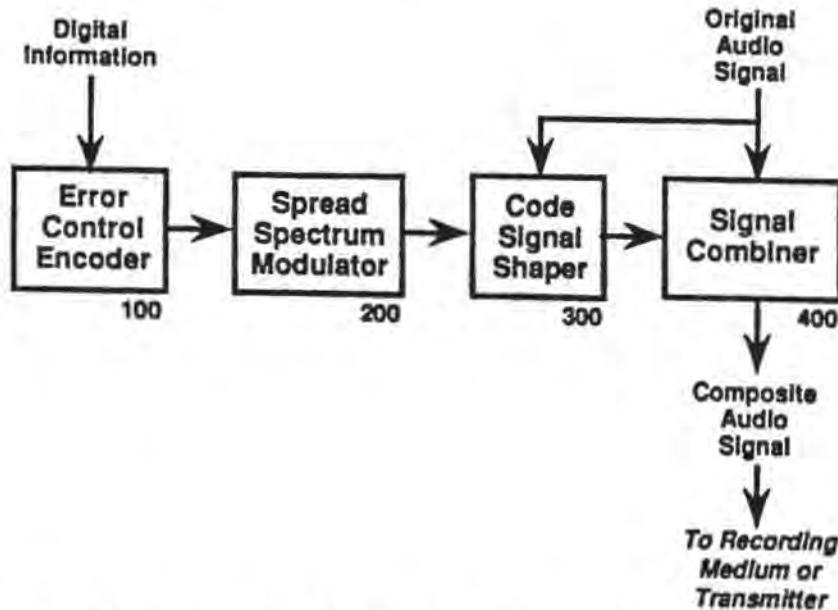
Primary Examiner—David D. Knepper  
 Attorney, Agent, or Firm—Henry D. Pahl, Jr.

[57]

**ABSTRACT**

A code signal representing a sequence of code symbols carrying digital information is generated with the frequency components of the code signal being essentially confined to a preselected signalling band lying within the bandwidth of an audio signal within which the code signal is to be embedded. The audio signal is continuously frequency analyzed over a frequency band encompassing the signalling band and the code signal is dynamically filtered as a function of the analysis thereby to provide a modified code signal with frequency components which are, at each time instant, essentially a preselected small proportion of the levels of the corresponding audio signal frequency components. Accordingly, the modified code signal can be combined with the audio signal to obtain a composite audio signal which is not readily distinguishable from the original audio signal by listening. Furthermore, the digital information can be recovered from the composite audio signal by a procedure which is essentially the compliment of that used to obtain the composite audio signal.

25 Claims, 11 Drawing Sheets



**Top Level Block Diagram of Information Embedding Process.**



US005287407A

**United States Patent [19]****Holmes****[11] Patent Number: 5,287,407****[45] Date of Patent: Feb. 15, 1994****[54] COMPUTER SOFTWARE PROTECTION****[75] Inventor:** Keith Holmes, Dublin, Ireland**[73] Assignee:** International Business Machines Corporation, Armonk, N.Y.**[21] Appl. No.:** 704,757**[22] Filed:** May 23, 1991**[30] Foreign Application Priority Data**

May 31, 1990 [EP] European Pat. Off. .... 90305964.0

**[51] Int. Cl.<sup>5</sup>** ..... H04L 9/00**[52] U.S. Cl.** ..... 380/4**[58] Field of Search** ..... 380/4**[56] References Cited****U.S. PATENT DOCUMENTS**

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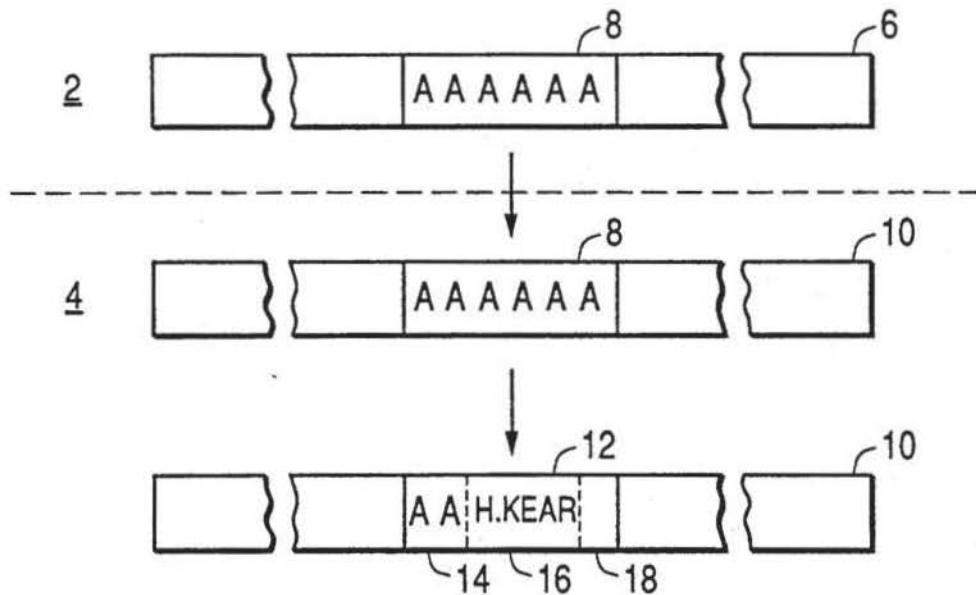
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*Primary Examiner—David Cain  
Attorney, Agent, or Firm—Lauren C. Bruzzone; Jesse L. Abzug***[57] ABSTRACT**

A master copy of a software file has within it a predetermined block of data. When a copy of the file is made that block of data within the copied file is located and overwritten with data identifying the copied file. When an unauthorized copy is found, the data identifying the copy can be read and the source of the unauthorized copy may be traced. The invention is particularly suited to use with software distribution over a computer network in which details such as the time the copied file was made and the name of the authorized user can be embedded within the copy.

**13 Claims, 1 Drawing Sheet**



US005243423A

# United States Patent [19]

DeJean et al.

[11] Patent Number: 5,243,423

[45] Date of Patent: Sep. 7, 1993

- [54] SPREAD SPECTRUM DIGITAL DATA  
TRANSMISSION OVER TV VIDEO

[75] Inventors: Jean P. DeJean, Cincinnati, Ohio;  
Daozheng Lu, Buffalo Grove, Ill.;  
Robert Weissman, Westport, Conn.

[73] Assignee: A. C. Nielsen Company, Northbrook,  
Ill.

[21] Appl. No.: 811,805

[22] Filed: Dec. 20, 1991

[51] Int. Cl.<sup>5</sup> ..... H04N 7/08

[52] U.S. Cl. ..... 358/142; 358/141

[58] Field of Search ..... 358/142, 141, 167;  
375/1

[56] References Cited

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*Primary Examiner—James J. Groody*

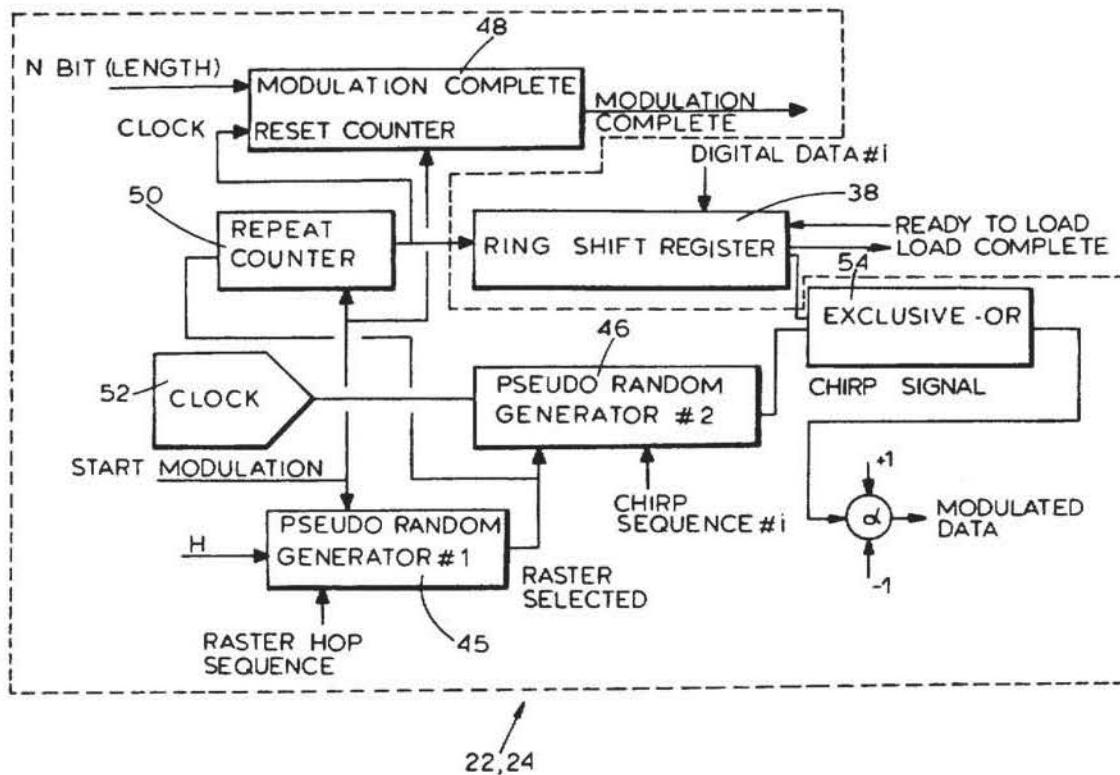
*Assistant Examiner—David E. Harvey*

*Attorney, Agent, or Firm*—Marshall, O'Toole, Gerstein,  
Murray & Borun

[57] ABSTRACT

A co-channel communication system allows transmission of one or more data signals in an active or visible portion of a video raster in a manner that is imperceptible to a viewer. More particularly, the data signal is transmitted over a preselected active video lines of a video raster. In order to reduce the perceptibility of the data signal, the video lines over which the data signal is transmitted is varied according to a random sequence. In an alternate embodiment, the data is also modulated at relatively low modulation levels, for example, by converting the data signal to a spread spectrum signal.

**17 Claims, 4 Drawing Sheets**



US005161210A

**United States Patent [19]**

Druyvesteyn et al.

[11] Patent Number: **5,161,210**[45] Date of Patent: **Nov. 3, 1992**

[54] **CODER FOR INCORPORATING AN AUXILIARY INFORMATION SIGNAL IN A DIGITAL AUDIO SIGNAL, DECODER FOR RECOVERING SUCH SIGNALS FROM THE COMBINED SIGNAL, AND RECORD CARRIER HAVING SUCH COMBINED SIGNAL RECORDED THEREON**

[75] Inventors: **Willem F. Druyvesteyn; Abraham Hoogendoorn; Leon M. Van De Kerkhof; Raymond N. J. Veldhuis**, all of Eindhoven, Netherlands

[73] Assignee: **U.S. Philips Corporation, New York, N.Y.**

[21] Appl. No.: **433,631**

[22] Filed: **Nov. 8, 1989**

[30] **Foreign Application Priority Data**

Nov. 10, 1988 [NL] Netherlands ..... 8802769  
Apr. 25, 1989 [NL] Netherlands ..... 8901032

[51] Int. Cl.<sup>5</sup> ..... **G10L 9/00; G10L 7/04**

[52] U.S. Cl. ..... **395/2; 381/31**

[58] Field of Search ..... **381/29-40;  
395/2**

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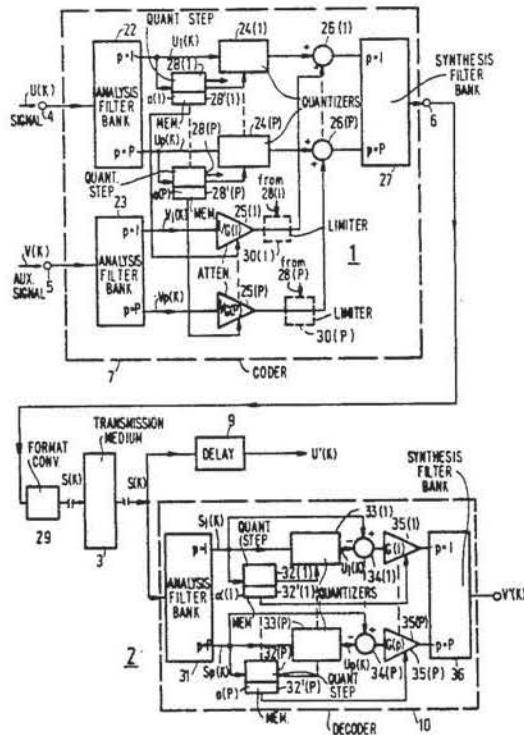
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Primary Examiner—Allen R. MacDonald  
Assistant Examiner—David D. Knepper  
Attorney, Agent, or Firm—Leroy Eason

[57] **ABSTRACT**

The audio signal is divided into frequency sub-bands, the sub-band samples are quantized according to a predetermined quantizing criterion, and the quantized samples in one or more sub-bands are summed with samples of the auxiliary signal in such sub-bands, the auxiliary signal sample in a sub-band having a maximum amplitude less than half the quantization step used in such sub-band. The combined signal, covering the entire frequency band of the audio signal, can be transmitted or recorded on a record carrier. Upon audio reproduction at a receiver only the audio signal will be audible, the auxiliary signal being masked due to the psycho-acoustic characteristics of the human auditory system which are unresponsive to low-level noise in the presence of high amplitude sound. The receiver includes a decoder which analyzes the combined signal into the original frequency sub-bands and re-quantizes the sub-band signals using the same quantizing criterion as at the coder. The auxiliary signal is reconstructed by subtracting the quantized signal sample in each sub-band from the non-quantized signal sample therein and combining the non-quantized sub-band signal sample. The auxiliary signal may be a copy inhibit code which serves to inhibit a recorder from recording the audio signal, thus protecting against unauthorized copying.

**14 Claims, 6 Drawing Sheets**





US007058570B1

(12) United States Patent  
Yu et al.(10) Patent No.: US 7,058,570 B1  
(45) Date of Patent: Jun. 6, 2006

## (54) COMPUTER-IMPLEMENTED METHOD AND APPARATUS FOR AUDIO DATA HIDING

(75) Inventors: Hong Heather Yu, Plainsboro, NJ (US); Xin Li, Princeton, NJ (US)

(73) Assignee: Matsushita Electric Industrial Co., Ltd., Osaka (JP)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/499,525

(22) Filed: Feb. 10, 2000

(51) Int. Cl.  
G10L 19/04 (2006.01)

(52) U.S. Cl. .... 704/219

(58) Field of Classification Search ..... 704/270,

704/221, 222, 219, 258; 382/100; 713/176  
See application file for complete search history.

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Primary Examiner—Wayne Young

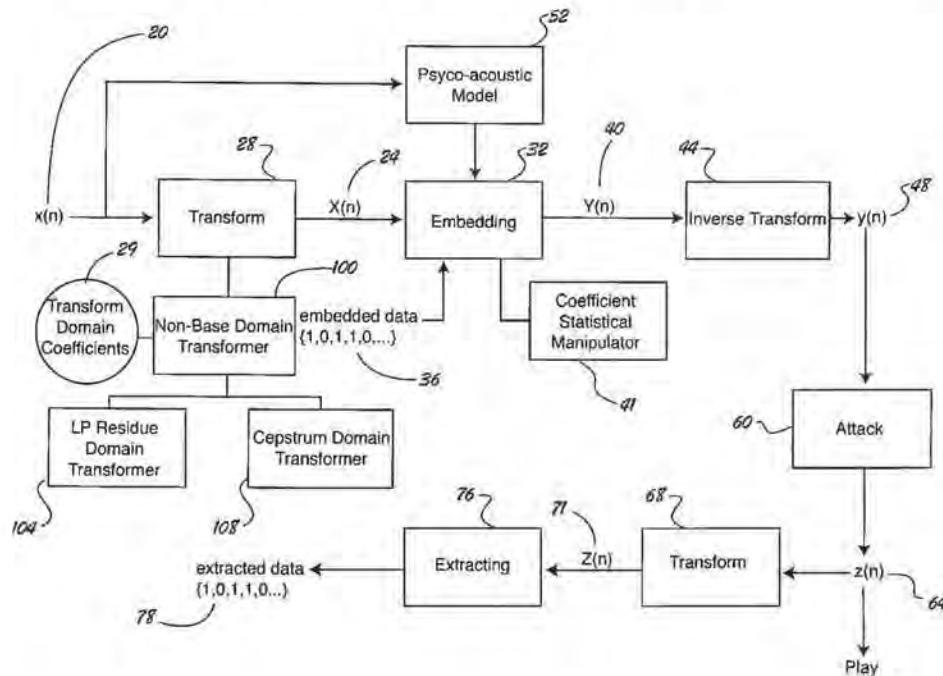
Assistant Examiner—Jakieda R. Jackson

(74) Attorney, Agent, or Firm—Harness, Dickey &amp; Pierce, PLC

## (57) ABSTRACT

A computer-implemented method and apparatus for embedding hidden data in an audio signal. An audio signal is received in a base domain and then transformed into a non-base domain, such as cepstrum domain or LP residue domain. The statistical mean manipulation is employed on selected transform coefficients to embed hidden data. The introduced distortion is controlled by psychoacoustic model to ensure the imperceptibility of the embedded hidden data. Scrambling techniques can be plugged in to further increase the security of the data hiding system. The present new audio data hiding scheme provides transparent audio quality, sufficient embedding capacity, and high survivability over a wide range of common signal processing attacks.

23 Claims, 5 Drawing Sheets





US006775772B1

(12) **United States Patent**  
Binding et al.

(10) Patent No.: **US 6,775,772 B1**  
(45) Date of Patent: **Aug. 10, 2004**

(54) **PIGGY-BACKED KEY EXCHANGE PROTOCOL FOR PROVIDING SECURE LOW-OVERHEAD BROWSER CONNECTIONS FROM A CLIENT TO A SERVER USING A TRUSTED THIRD PARTY**

(75) Inventors: **Carl Binding**, Thalwil (CH); **Stefan Georg Hild**, Adliswil (CH); **Luke James O'Connor**, Adliswil (CH); **Sandeep K. Singhal**, Raleigh, NC (US); **Victor John Shoup**, Zurich (CH); **Michael Steiner**, Saarbruecken (DE)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/415,827**

(22) Filed: **Oct. 12, 1999**

(51) Int. Cl.<sup>7</sup> ..... **H04L 9/00**

(52) U.S. Cl. ..... **713/171; 713/151; 713/152; 713/200; 380/279; 709/220; 709/228; 709/230; 709/310; 709/315; 345/804**

(58) Field of Search ..... **709/220, 228, 709/230, 310, 315; 713/151, 152, 171, 200; 345/804; 380/279**

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Primary Examiner—Gregory Morse

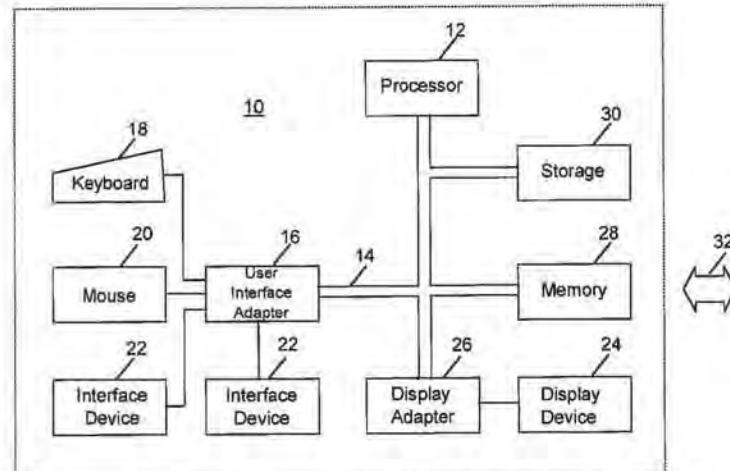
Assistant Examiner—Paul E. Callahan

(74) Attorney, Agent, or Firm—A. Bruce Clay; Marcia L. Doubet

(57) **ABSTRACT**

A method, system, and computer program product for establishing security parameters that are used to exchange data on a secure connection. A piggy-backed key exchange protocol is defined, with which these security parameters are advantageously exchanged. By piggy-backing the key exchange onto other already-required messages (such as a client's HTTP GET request, or the server's response thereto), the overhead associated with setting up a secure browser-to-server connection is minimized. This technique is defined for a number of different scenarios, where the client and server may or may not share an encoding scheme, and is designed to maintain the integrity of application layer communication protocols. In one scenario, a client and a server exchange secure messages using a trusted third party.

**67 Claims, 3 Drawing Sheets**





US006539475B1

(12) **United States Patent**  
Cox et al.

(10) Patent No.: US 6,539,475 B1  
(45) Date of Patent: Mar. 25, 2003

(54) **METHOD AND SYSTEM FOR PROTECTING DIGITAL DATA FROM UNAUTHORIZED COPYING**

(75) Inventors: Ingemar J. Cox, Lawrenceville, NJ (US); Matthew L. Miller, Princeton, NJ (US)

(73) Assignee: NEC Corporation, Tokyo (JP)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/215,960

(22) Filed: Dec. 18, 1998

(51) Int. Cl.<sup>7</sup> H04N 7/16; H04N 7/167; H04L 9/28

(52) U.S. Cl. 713/100; 713/176; 713/193; 705/57; 380/201; 380/202; 380/203

(58) Field of Search 713/176, 193; 380/201-203; 705/57

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Primary Examiner—Gail Hayes

Assistant Examiner—Taghi T. Arani

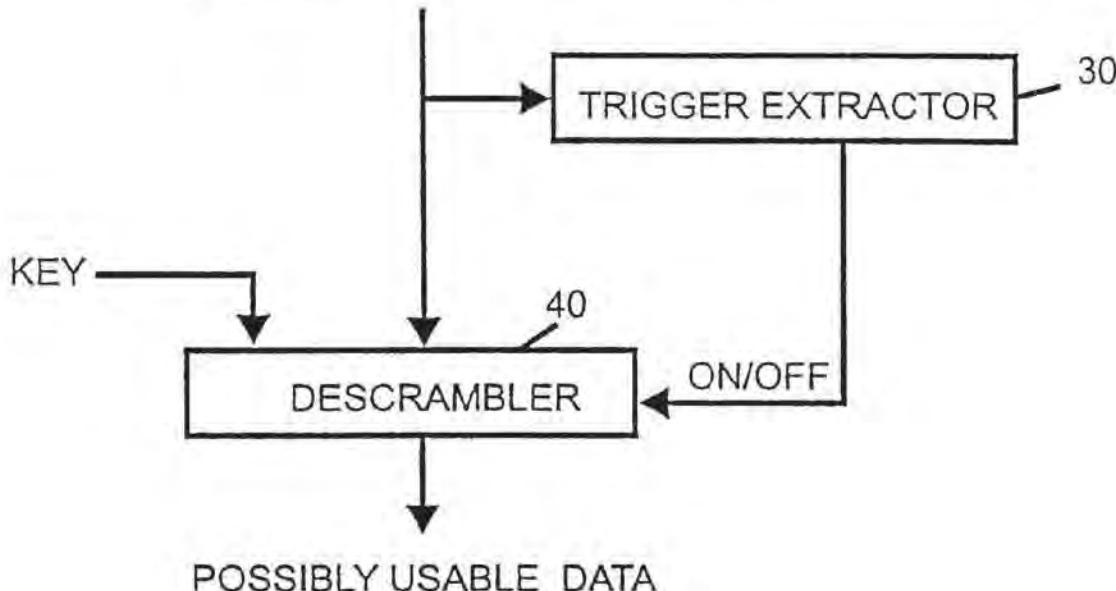
(74) Attorney, Agent, or Firm—Scully, Scott, Murphy & Presser

(57) **ABSTRACT**

Data is protected from unauthorized copying by scrambling an unauthorized version of the data, but descrambling an authorized version of the data. This is done using a trigger signal. One property of the trigger signal is that it is preserved through signal transformations, such as one or more of compression, decompression, analog to digital conversion, and digital to analog conversion. As a result of this property the trigger signal can be detected in either scrambled or descrambled data. The trigger signal is embedded into the data to form watermarked data. The watermarked data is passed through a descrambler, where the trigger signal, if present, is extracted. A descrambling key and a descrambling algorithm are applied to the watermarked data if the trigger signal is present, but not applied to the watermarked data if the trigger signal is not present.

12 Claims, 3 Drawing Sheets

POSSIBLY PROTECTED DATA





US006530021B1

(12) **United States Patent**  
Epstein et al.

(10) **Patent No.:** US 6,530,021 B1  
(45) **Date of Patent:** Mar. 4, 2003

(54) **METHOD AND SYSTEM FOR PREVENTING UNAUTHORIZED PLAYBACK OF BROADCASTED DIGITAL DATA STREAMS**

(75) Inventors: Michael Epstein, Spring Valley, NY (US); Michael Pasieka, Thornwood, NY (US)

(73) Assignee: Koninklijke Philips Electronics N.V., Eindhoven (NL)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/323,808

(22) Filed: Jun. 2, 1999

**Related U.S. Application Data**

(60) Provisional application No. 60/093,402, filed on Jul. 20, 1998.

(51) **Int. Cl.<sup>7</sup>** ..... G06F 1/24

(52) **U.S. Cl.** ..... 713/176; 713/161; 713/168; 713/170

(58) **Field of Search** ..... 713/161, 168, 713/170, 176, 200, 201

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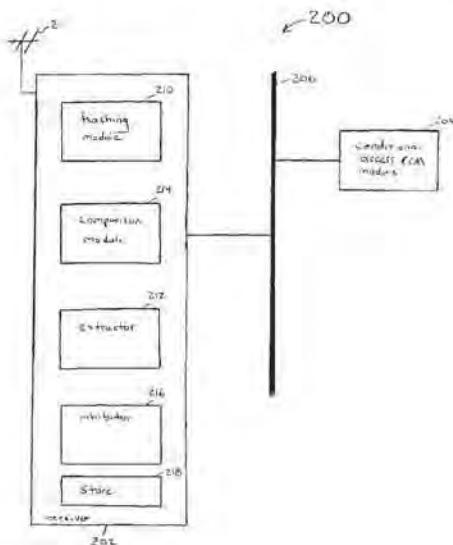
**Primary Examiner**—Thomas R. Peeso

(74) **Attorney, Agent, or Firm**—Daniel J. Piotrowski

(57) **ABSTRACT**

A method and system are provided for preventing the unauthorized playback of broadcasted digital data streams. The method includes the step of embedding a watermark in a digital data stream. The digital data stream having the embedded watermark is encrypted. The encrypted digital data stream is broadcasted with a ticket. The encrypted digital data stream and the ticket are received. The ticket is saved and the encrypted digital data stream is provided to a decryption device to decrypt the digital data stream. The decrypted digital data stream is received from the decryption device. The watermark is extracted from the decrypted digital data stream. A one-way cryptographic hashing function is applied to the saved ticket. The hashed ticket is compared to the extracted watermark. Playback of the digital data stream is prevented, when the hashed ticket does not match the extracted watermark.

11 Claims, 3 Drawing Sheets





US006493457B1

(12) **United States Patent**  
Quackenbush et al.

(10) Patent No.: US 6,493,457 B1  
(45) Date of Patent: Dec. 10, 2002

(54) ELECTRONIC WATERMARKING IN THE COMPRESSED DOMAIN UTILIZING PERCEPTUAL CODING

(75) Inventors: Schuyler Reynier Quackenbush, Westfield, NJ (US); Amy Ruth Reibman, Matawan, NJ (US); David Hilton Shur, Aberdeen, NJ (US); James H. Snyder, North Plainfield, NJ (US)

(73) Assignee: AT&T Corp., New York, NY (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/192,359

(22) Filed: Nov. 16, 1998

**Related U.S. Application Data**

(60) Provisional application No. 60/067,225, filed on Dec. 3, 1997.

(51) Int. Cl.<sup>7</sup> ..... G06K 9/00

(52) U.S. Cl. ..... 382/100; 382/232; 382/251; 380/252; 380/287; 713/176

(58) Field of Search ..... 382/100, 232, 382/239, 251; 380/210, 252, 287, 54; 713/176; 704/200.1, 273; 381/73.1; 348/460, 463

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Primary Examiner—Joseph Mancuso

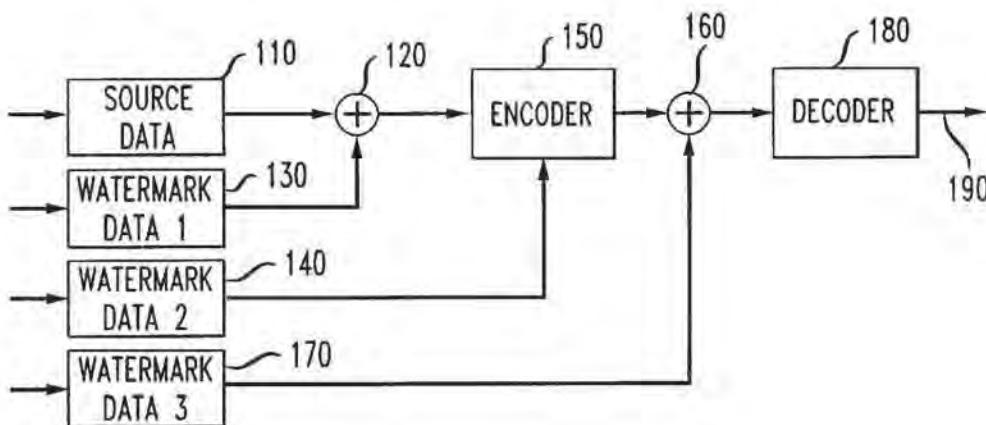
Assistant Examiner—Anand Bhatnagar

(74) Attorney, Agent, or Firm—Banner & Witcoff, Ltd.

(57) **ABSTRACT**

A method and apparatus are described for inserting a watermark in the compressed domain. The watermark inserted does not require a reference. An overall watermarking system incorporating the invention combines cleartext, bitstream, and integrated watermarking. In a perceptual coder, the data enters a filterbank, where it is processed into multiple separate coefficients. A rate/distortion control module uses noise threshold information from a perceptual coder, together with bit-count information from a noiseless coder, to compute scale factors. The coefficients are multiplied by the scale factors and quantized, then noiseless coded and then output for further processing/transmission. The invention supports three embodiments for inserting a mark into the bitstream imperceptibly. It is assumed that some set of scale factor bands have been selected, into which mark data will be inserted. In one embodiment, a set of multipliers  $\{x_i = 2^{N_i}; i \in M\}$  is chosen. Each triple is modified by dividing the scale factor by  $x_i$ , multiplying the quantized coefficients by  $\{x_i\}$ , and adding mark data to the non-zero modified quantized coefficients. In an alternate embodiment, watermark data is represented via two characteristics of the bitstream data. A Huffinan table is selected for encoding the Scale Factor Band receiving watermark data which is not the table that would normally be used. The watermark data bit is set according to any desired scheme, and the quantized coefficients are derived using the alternate Huffinan table. In another embodiment, watermarking is integrated with quantization. The watermark is therefore difficult to remove without perceptible effects. The fact that marking data is present is again indicated by characteristics of the bitstream data. The modification factors  $\{x_i\}$  are now all close to unity.

42 Claims, 5 Drawing Sheets



(12) United States Patent  
Jones et al.(10) Patent No.: US 6,381,618 B1  
(45) Date of Patent: Apr. 30, 2002(54) METHOD AND APPARATUS FOR  
AUTOSYNCHRONIZING DISTRIBUTED  
VERSIONS OF DOCUMENTS(75) Inventors: Jeffrey Allen Jones, Round Rock;  
Michael Wayne Brown, Georgetown,  
both of TX (US)(73) Assignee: International Business Machines  
Corporation, Armonk, NY (US)(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/335,286

(22) Filed: Jun. 17, 1999

(51) Int. Cl.<sup>7</sup> G06F 17/00

(52) U.S. Cl. 707/203; 707/10; 709/201

(58) Field of Search 707/1-10, 100-104,  
707/200-206; 709/100-332

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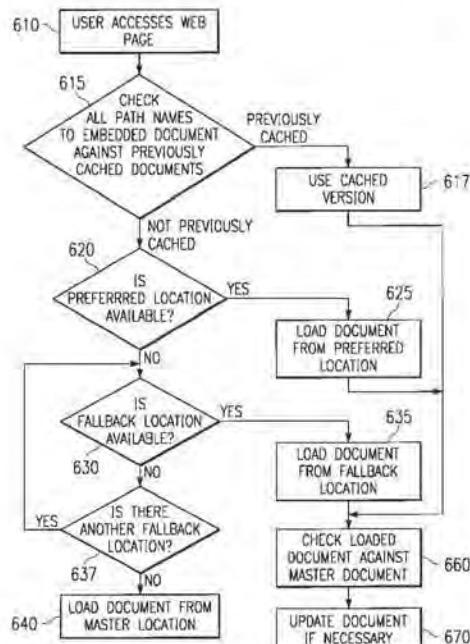
*Primary Examiner*—Thomas Black*Assistant Examiner*—David Jung

(74) Attorney, Agent, or Firm—Duke W. Yee; Jeffrey S. LaBaw; Stephen R. Loe

## (57) ABSTRACT

Synchronizing copies of a first document in a distributed computing environment. According to a preferred embodiment, a path to a preferred repository for the first document and a path to a master repository for the first document are embedded in a second document. A copy of the first document is retrieved from the preferred repository. The master repository is checked to determine whether the retrieved copy is a copy of a most recent version of the first document. In response to the determination that the retrieved copy is the most recent version of the first document, the second document is formatted using the retrieved copy.

26 Claims, 7 Drawing Sheets





US006330672B1

(12) **United States Patent**  
**Shur**

(10) **Patent No.:** US 6,330,672 B1  
(45) **Date of Patent:** \*Dec. 11, 2001

(54) **METHOD AND APPARATUS FOR WATERMARKING DIGITAL BITSTREAMS**(75) **Inventor:** David Hilton Shur, Aberdeen, NJ (US)(73) **Assignee:** AT&T Corp., New York, NY (US)

(\*) **Notice:** This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** 09/108,135(22) **Filed:** Jun. 30, 1998**Related U.S. Application Data**

(60) Provisional application No. 60/067,225, filed on Dec. 3, 1997.

(51) **Int. Cl.<sup>7</sup>** ..... H04L 9/00(52) **U.S. Cl.** ..... 713/176; 380/54; 382/251(58) **Field of Search** ..... 713/176; 380/54, 380/202; 705/51, 57, 58; 382/251, 100(56) **References Cited****U.S. PATENT DOCUMENTS**

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5,889,868 *	3/1999	Moskowitz et al.	.....	713/176
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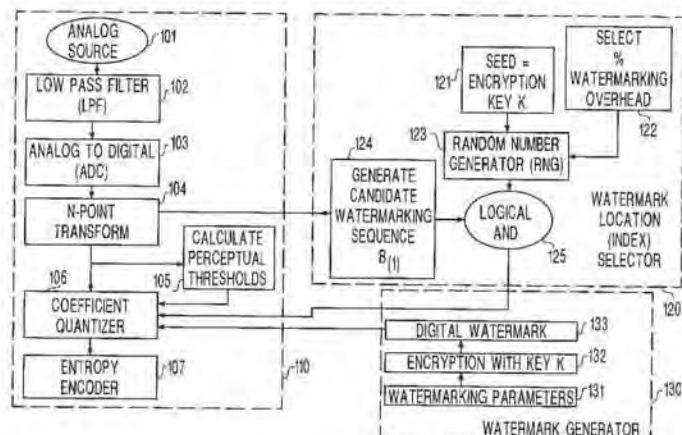
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*Primary Examiner*—Albert Decayd*Assistant Examiner*—Steve Kabakoff(57) **ABSTRACT**

A signal is encoded, for example, perceptually and, during or after the perceptual coding process, a digital watermark is inserted into a quantized digital information signal resulting from the perceptual coding process in such a manner that its insertion is imperceptible to one later listening to, displaying or otherwise utilizing the information signal. Moreover, the digital watermark may be inserted in accordance with a key indicative of the location of the mark in the digitally encoded signal. The key may be protected with a trusted entity and distributed in such a manner as to be not detectable by a pirate. Consequently, the key may be utilized at watermarking apparatus that can be located anywhere in the distribution channel of a copyright protected work. The key may be embedded in a secure microprocessor of validating apparatus at a point of distribution or even at a point of sale. In this manner, when or after a digital bitstream is fixed in a medium of expression or broadcast, the watermark can be applied at the time of fixing in a copy, thus validating an original legitimate copy. For example, a compact disc recording may be validated at the point of sale as an authorized copy through watermarking (validating) apparatus according to the present invention or, at the time of broadcast over radio frequencies or distribution via the Internet, information may be watermarked. In this manner, even though a work may be pirated, further information may be included or otherwise indicated by the watermark to assist in, not only recognizing a pirated work and the original from which the pirate copy was produced, but the identity of the pirate who later makes an unauthorized copy of the original.

**36 Claims, 4 Drawing Sheets**



US006285775B1

(12) **United States Patent**  
**Wu et al.**

(10) **Patent No.:** US 6,285,775 B1  
(45) **Date of Patent:** Sep. 4, 2001

(54) **WATERMARKING SCHEME FOR IMAGE AUTHENTICATION**(75) Inventors: **Min Wu; Bede Liu**, both of Princeton, NJ (US)(73) Assignee: **The Trustees of the University of Princeton**, Princeton, NJ (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/164,474**(22) Filed: **Oct. 1, 1998**(51) Int. Cl.<sup>7</sup> ..... **G06K 9/00**(52) U.S. Cl. ..... **382/100**

(58) Field of Search ..... 382/100, 232; 380/28, 29, 30, 54; 705/51

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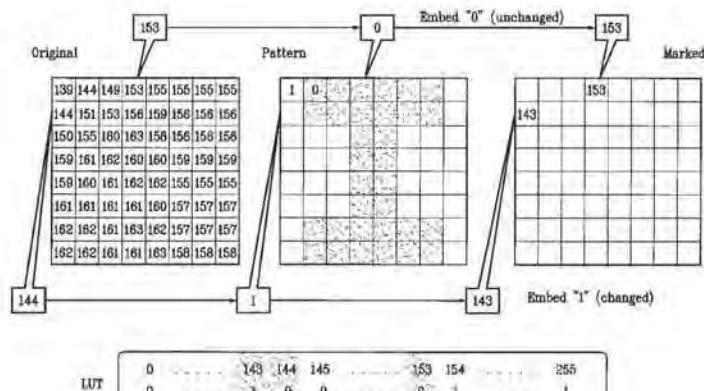
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*Primary Examiner*—Andrew W. Johns*Assistant Examiner*—Shervin Nakhjavan(74) *Attorney, Agent, or Firm*—Woodcock Washburn Kurtz Mackiewicz & Norris LLP(57) **ABSTRACT**

A digital watermarking process whereby an invisible watermark inserted into a host image is utilized to determine whether or not the image has been altered and, if so, where in the image such alteration occurred. The watermarking method includes the steps of providing a look-up table containing a plurality of coefficients and corresponding values; transforming the image into a plurality of blocks, wherein each block contains coefficients matching coefficients in the look-up table; and embedding the watermark in the image by performing the following substeps for at least some of the blocks: First, a coefficient is selected for insertion of a marking value representative of a corresponding portion of the watermark. Next, the value of the selected coefficient is used to identify a corresponding value in the look-up table. Finally, the identified coefficient is left unchanged if the corresponding value is the same as the marking value, and is changed if the corresponding value is different from the marking value. After the insertion of the watermark, the image may be stored in a lossy-compression form, thus permitting efficient storage and distribution. Moreover, the method may be used to produce two output signals for authentication: (1) a meaningful pattern to facilitate a quick visual check, and (2) an additional signal to detect unauthorized alteration. The method can be applied to an image compressed using JPEG or other techniques, such as Wavelet compression, and the marked image can be kept in the compressed format. Any alteration made on the marked image can be localized, making the method suitable for use in a "trustworthy" digital camera or camcorder.

**14 Claims, 13 Drawing Sheets-**

(12) **United States Patent**  
Bloom et al.(10) Patent No.: US 6,282,300 B1  
(45) Date of Patent: Aug. 28, 2001(54) **ROTATION, SCALE, AND TRANSLATION RESILIENT PUBLIC WATERMARKING FOR IMAGES USING A LOG-POLAR FOURIER TRANSFORM**

(75) Inventors: Jeffrey A. Bloom, Plainsboro; Ingemar J. Cox, Lawrenceville; Matthew L. Miller; Min Wu, both of Princeton, all of NJ (US); Ching-Yung Lin, New York; Yui Man Lui, Middle Island, both of NY (US)

(73) Assignee: Signafy, Inc., Princeton, NJ (US)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/489,752

(22) Filed: Jan. 21, 2000

(51) Int. Cl.<sup>7</sup> ..... H04K 1/00

(52) U.S. Cl. ..... 382/100

(58) Field of Search ..... 382/100, 232, 382/280; 380/210, 252, 287, 54; 713/176; 370/527, 529

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Lin et al., "Public Watermarking Surviving General Scaling and Cropping: An Application for Print-and-Scan Process," Multimedia and Security Workshop at ACM Multimedia '99, Oct. 1999, pp. 41-46.\*

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*Primary Examiner*—Andrew W. Johns

(74) Attorney, Agent, or Firm—Scully, Scott, Murphy &amp; Presser

(57) **ABSTRACT**

A method for detecting a watermark signal in digital image data. The detecting method includes the steps of: computing a log-polar Fourier transform of the image data to obtain a log-polar Fourier spectrum; projecting the log-polar Fourier spectrum down to a lower dimensional space to obtain an extracted signal; comparing the extracted signal to a target watermark signal; and declaring the presence or absence of the target watermark signal in the image data based on the comparison. Also provided is a method for inserting a watermark signal in digital image data to obtain a watermarked image. The inserting method includes the steps of: computing a log-polar Fourier transform of the image data to obtain a log-polar Fourier spectrum; projecting the log-polar Fourier spectrum down to a lower dimensional space to obtain an extracted signal; modifying the extracted signal such that it is similar to a target watermark; performing a one-to-many mapping of the modified signal back to log-polar Fourier transform space to obtain a set of watermarked coefficients; and performing an inverse log-polar Fourier transform on the set of watermarked coefficients to obtain a watermarked image.

14 Claims, 27 Drawing Sheets



US006230268B1

(12) **United States Patent**  
**Miwa et al.**

(10) **Patent No.:** **US 6,230,268 B1**  
(45) **Date of Patent:** **May 8, 2001**

(54) **DATA CONTROL SYSTEM**

(75) Inventors: **Kunihiko Miwa**, Hiratsuka; **Norishige Morimoto**, Tokyo-to; **Shuichi Shimizu**, Yokohama, all of (JP)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/127,061**

(22) Filed: **Jul. 31, 1998**

(30) **Foreign Application Priority Data**

Sep. 12, 1997 (JP) ..... 9-248272

(51) Int. Cl.<sup>7</sup> ..... **G06F 11/30**

(52) U.S. Cl. ..... **713/176; 713/164; 713/165; 713/182**

(58) Field of Search ..... **713/165, 164, 713/176, 179, 180, 182, 189, 200, 201**

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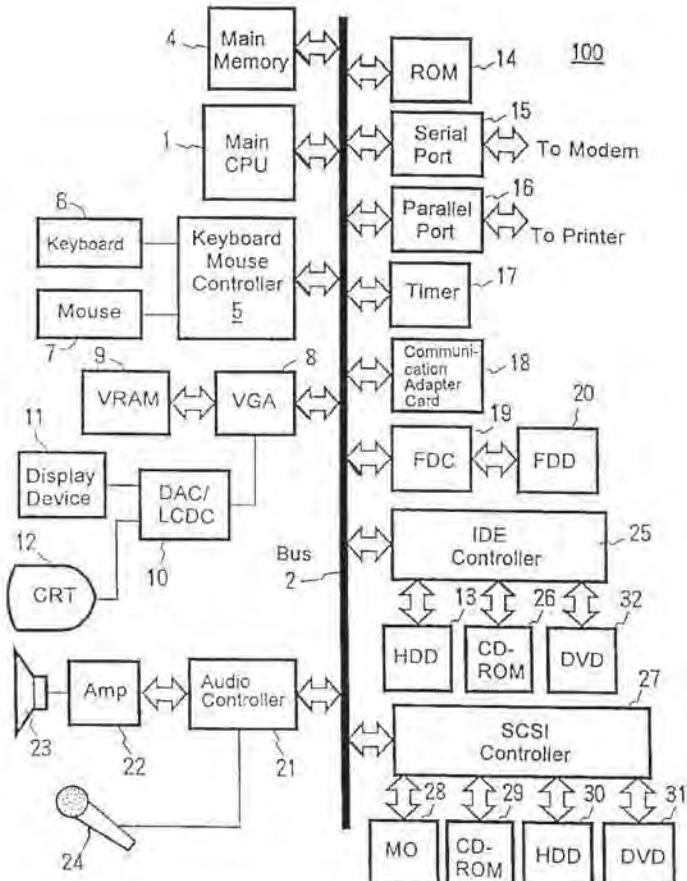
Primary Examiner—Thomas R. Peeso

(74) Attorney, Agent, or Firm—Scully, Scott, Murphy & Presser; Louis P. Herzberg

(57) **ABSTRACT**

An object of the Invention is to provide a system and method for effecting a secure data control using an electronic watermarking with a low manufacturing cost. A solution of the objective is a data control system is built which comprises; embedding a control flag indicating to control data using an electronic watermarking technique, preparing a token having information as to how to control the data by using the content of the data, distributing the token appended to the data, detecting the control flag from the distributed data, reading the token appended to the data when the control flag is detected, and controlling the data according to a pre-defined control rule of the token or the control flag. In addition, a subsequent data control is further suppressed by modifying the token in controlling the data.

**42 Claims, 7 Drawing Sheets**





US006208745B1

(12) **United States Patent**  
Florencio et al.

(10) Patent No.: **US 6,208,745 B1**  
(45) Date of Patent: **\*Mar. 27, 2001**

(54) **METHOD AND APPARATUS FOR IMBEDDING A WATERMARK INTO A BITSTREAM REPRESENTATION OF A DIGITAL IMAGE SEQUENCE**

(75) Inventors: **Dinei A. Florencio; Michael A. Isnardi**, both of Plainsboro, NJ (US)

(73) Assignee: **Sarnoff Corporation**, Princeton, NJ (US)

(\*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/001,205**

(22) Filed: **Dec. 30, 1997**

(51) Int. Cl.<sup>7</sup> ..... **G06K 9/00; G06K 9/36; H04L 9/00**

(52) U.S. Cl. ..... **382/100; 382/250; 713/176**

(58) Field of Search ..... **382/232, 250, 382/251, 100; 162/110; 380/4, 51; 713/176**

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Primary Examiner—Amelia Au

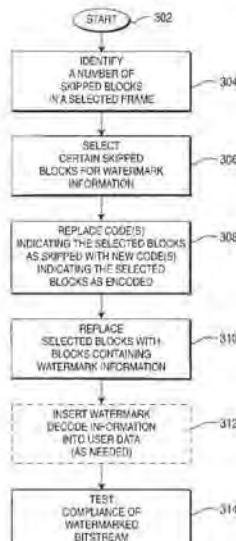
Assistant Examiner—Mehrdad Dastouri

(74) Attorney, Agent, or Firm—William J. Burke

(57) **ABSTRACT**

A method and apparatus that inserts watermark information directly into an encoded video bitstream. The method identifies specific blocks or macroblocks in an encoded video bitstream and inserts the watermark information directly into the bitstream such that these selected blocks are replaced with a block containing watermark information or augmented with watermark information.

**18 Claims, 2 Drawing Sheets**





US006154571A

**United States Patent [19]**

Cox et al.

[11] Patent Number: **6,154,571**[45] Date of Patent: **Nov. 28, 2000****[54] ROBUST DIGITAL WATERMARKING**

[75] Inventors: **Ingemar J. Cox**, Lawrenceville; **Matthew L. Miller**, Princeton, both of N.J.; **Ryoma Oami**, Tokyo, Japan

[73] Assignees: **NEC Research Institute, Inc.**, Princeton, N.J.; **NEC Corporation**, Tokyo, Japan

[21] Appl. No.: **09/118,467**[22] Filed: **Jul. 17, 1998****Related U.S. Application Data**

[60] Provisional application No. 60/090,532, Jun. 24, 1998.

[51] Int. Cl.<sup>7</sup> ..... **G06K 9/00**[52] U.S. Cl. ..... **382/250; 382/232; 382/100**[58] Field of Search ..... **382/100, 232, 382/250, 276, 251, 252, 244****[56] References Cited****U.S. PATENT DOCUMENTS**

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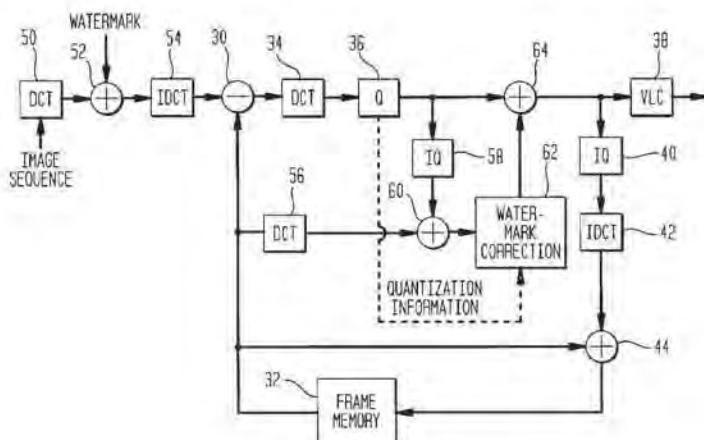
0690595	1/1995	European Pat. Off. ....	H04L 9/18
2196167	4/1988	United Kingdom .....	G11B 20/08
8908915	9/1989	WIPO .....	G11B 21/10
9520291	7/1995	WIPO .....	H04N 1/32
9621290	7/1996	WIPO .....	H04H 1/00
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*Primary Examiner*—Bijan Tadayon*Assistant Examiner*—Shervin Nakhjavan*Attorney, Agent, or Firm*—Philip J. Feig**[57] ABSTRACT**

A watermarking procedure that is applicable to images, audio, video and multimedia data to be watermarked divides the data to be watermarked into a set of  $n \times n$  blocks, such as the 8x8 blocks of MPEG. The same watermark signal can be distributed throughout the set of blocks in a large variety of ways. This allows the insertion algorithm to be changed without affecting the decoders. The decoding procedure first sums together the DCT coefficients of  $N$  sets of 8x8 blocks to form a set of  $N$  summed 8x8 blocks and then extracts the watermark from the summed block. Since the sum of the DCT blocks is equal to the DCT of the sum of the intensity blocks, efficient decoding can occur in both the spatial and frequency domains. The symmetric nature of the decoding process allows geometric distortions to be handled in the spatial domain and other signal distortions to be handled in the frequency domain. Moreover, insertion of a watermark signal into image data and the subsequent extraction of the watermark from watermarked image data which has been subject to distortion between the times of insertion and extraction involves the insertion of multiple watermarks designed to survive predefined distortions of the image data, such as panscan or letterbox mode transformations. Alternatively, a registration pattern in the image data, after the image data containing the registration pattern is subject to an unknown distortion, is used to compensate for distortion of the watermarked image data.

**10 Claims, 10 Drawing Sheets**



US006141754A

# United States Patent [19]

**Choy**

[11] Patent Number: **6,141,754**  
 [45] Date of Patent: **Oct. 31, 2000**

[54] INTEGRATED METHOD AND SYSTEM FOR CONTROLLING INFORMATION ACCESS AND DISTRIBUTION

6,044,469 3/2000 Horstmann ..... 713/200

[75] Inventor: **David M. Choy**, Los Altos, Calif.

## FOREIGN PATENT DOCUMENTS

[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.

40-8263440 10/1996 Japan ..... G06F 15/00

[21] Appl. No.: **08/979,713**

Primary Examiner—Robert W. Beausoleil, Jr.

[22] Filed: **Nov. 28, 1997**

Assistant Examiner—Christopher Revak

[51] Int. Cl.<sup>7</sup> ..... G06F 17/30; G06F 12/14  
 [52] U.S. Cl. ..... 713/200; 705/52; 705/59  
 [58] Field of Search ..... 713/200, 201,  
 713/202, 189, 194; 709/229, 226; 711/163;  
 705/51, 52, 55, 57, 59

Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak & Seas, PLLC

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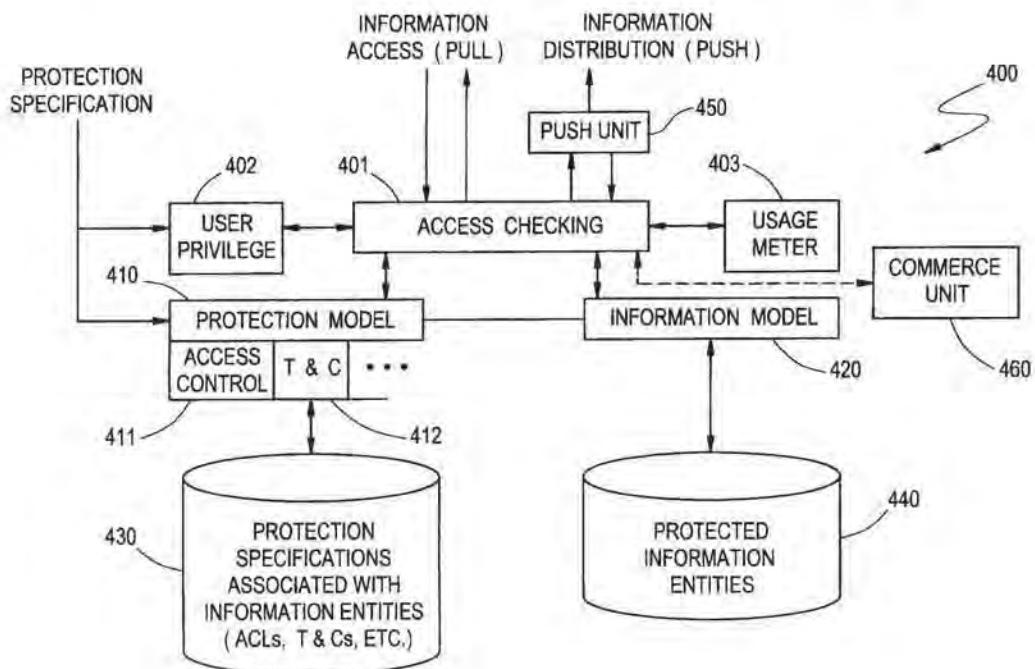
## ABSTRACT

### U.S. PATENT DOCUMENTS

A distributed content entity includes a protection specification and an information entity, in which the protection specification and the information entity are attached and transported together. The protection specification includes information for controlling the use of the information entity. A framework generates the distributed content entity, in which the framework includes a protection specification unit storing the protection specification and including an access control enforcement manager and an enhanced access control enforcement manager; an information unit for storing the protected information entity; and an access checking unit connected to the protection specification unit and the information unit. The access checking unit checks whether a user has a privilege to access the protected information entity based on the protection specification and the access control manager, and checks whether the requested access meets conditions determined based on the protection specification and enforced by the enhanced access control manager. An example of the enhanced access control manager is a terms and conditions enforcement manager for enforcing the terms and conditions of an agreement relating to permitted uses of the protected information entity.

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66 Claims, 4 Drawing Sheets





US006069914A

**United States Patent [19]****Cox****[11] Patent Number: 6,069,914****[45] Date of Patent: May 30, 2000****[54] WATERMARKING OF IMAGE DATA USING MPEG/JPEG COEFFICIENTS****[75] Inventor: Ingemar J. Cox, Lawrenceville, N.J.****[73] Assignee: NEC Research Institute, Inc., Princeton, N.J.****[21] Appl. No.: 08/715,953****[22] Filed: Sep. 19, 1996****[51] Int. Cl.<sup>7</sup> H04B 1/69****[52] U.S. Cl. 375/150; 375/130; 375/243; 380/5****[58] Field of Search 380/5; 375/130, 375/140, 141, 142, 147, 150, 243, 254****[56] References Cited****U.S. PATENT DOCUMENTS**

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9621290	7/1996	WIPO .....	H04H 1/00
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9627259	9/1996	WIPO .....	H04N 1/32

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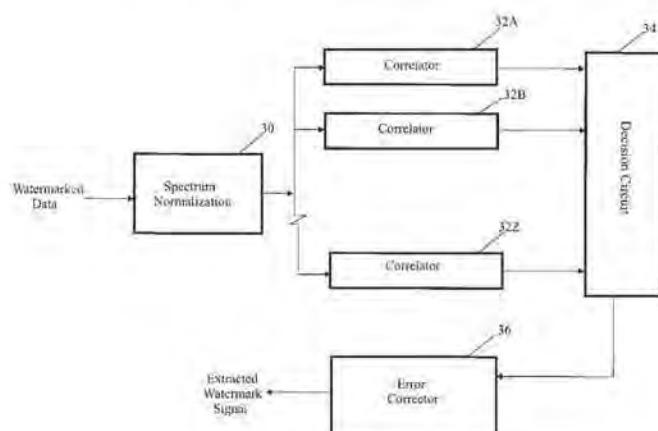
"Digital Copyright: Who Owns What?" NewMedia, Sep. 1995, pp. 38-43.

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*Primary Examiner—Young T. Tse  
Attorney, Agent, or Firm—Philip J. Feig; Jeffery J. Brosemer*

**ABSTRACT**

A watermark is embedded into video/image/multimedia data using spread spectrum methodology. The watermark is extracted from watermarked data without the use of an original or unwatermarked version of the data by using MPEG/JPEG coefficients. The image to be watermarked is divided into subimages. Each subimage is embedded with a watermark. When extracting the watermark, the result from each subimage is combined to determine the originally embedded watermark.

**18 Claims, 2 Drawing Sheets**



US006041316A

**United States Patent [19]**

Allen

[11] Patent Number: **6,041,316**[45] Date of Patent: **Mar. 21, 2000**[54] **METHOD AND SYSTEM FOR ENSURING ROYALTY PAYMENTS FOR DATA DELIVERED OVER A NETWORK**[75] Inventor: **Jonathon Brandon Allen,**  
Mountainside, N.J.[73] Assignee: **Lucent Technologies Inc., Murray Hill,**  
N.J.[21] Appl. No.: **08/280,039**[22] Filed: **Jul. 25, 1994**[51] Int. Cl.<sup>7</sup> **H04L 9/32**[52] U.S. Cl. **705/52; 705/77**[58] Field of Search **380/4; 705/51-54**[56] **References Cited**

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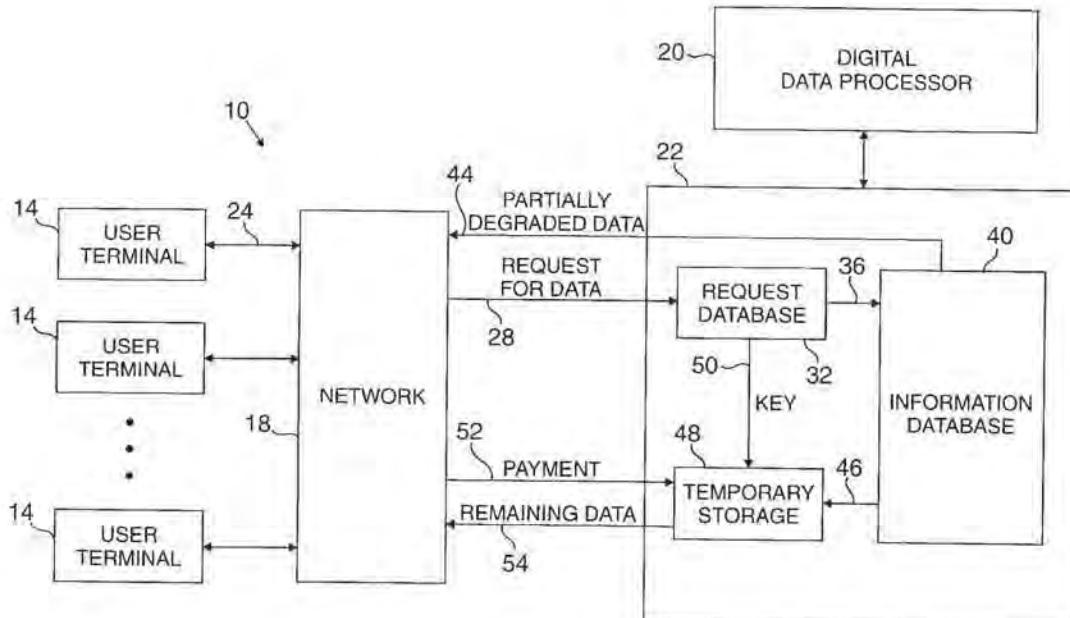
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Primary Examiner—Gilberto Barrón, Jr.

[57] **ABSTRACT**

A method and system for delivering data over a communication network which ensures proper payment of royalties while preserving free access to data for purposes such as browsing or research. An exemplary method in accordance with the present invention includes the steps of providing a partially-degraded version of the data over the network, without payment of a royalty fee, to a customer at a user terminal connected to the network; and providing a higher quality version of the data to the customer over the network if the customer is entitled to receive the higher quality version. The determination as to whether the customer is so entitled may be made by, for example, determining if a royalty fee payment has been received. The partially-degraded version of the data is substantially recognizable when displayed, printed, played, run or otherwise utilized by the customer at the user terminal, and may be generated by, for example, deleting or encrypting a portion of the undegraded data. The higher quality version may be provided by transmitting the complete higher quality version, or transmitting remaining data such as the deleted portion or a decryption key, to the user terminal.

**27 Claims, 2 Drawing Sheets**



US006009176A

**United States Patent [19]****Gennaro et al.****[11] Patent Number: 6,009,176****[45] Date of Patent: Dec. 28, 1999****[54] HOW TO SIGN DIGITAL STREAMS**

[75] Inventors: **Rosario Gennaro**, New York; **Pankaj Rohatgi**, Yorktown Heights, both of N.Y.

[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.

[21] Appl. No.: **08/799,813**

[22] Filed: **Feb. 13, 1997**

[51] Int. Cl.<sup>6</sup> ..... H04L 9/00; H04L 9/30

[52] U.S. Cl. ..... 380/25; 380/23; 380/30;  
380/49; 370/522

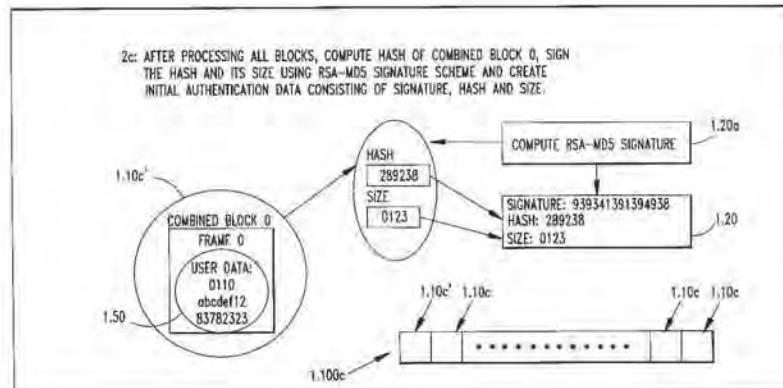
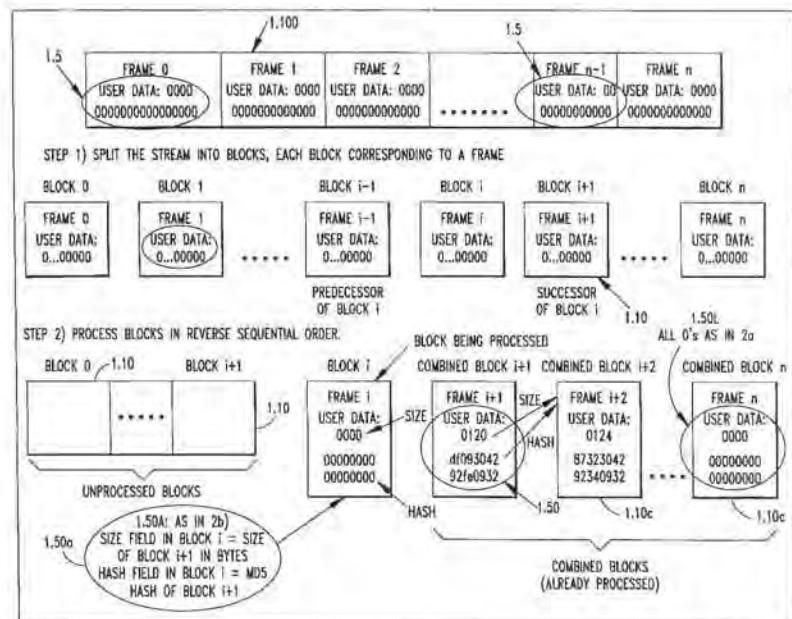
[58] Field of Search ..... 380/9, 23, 25,  
380/29, 30, 37, 43, 49, 50, 59; 370/522,  
527, 528

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*Primary Examiner*—Bernarr E. Gregory*Attorney, Agent, or Firm*—Douglas W. Cameron; Anne Vachon Dougherty**[57] ABSTRACT**

A method of signing digital streams so that a receiver of the stream can authenticate and consume the stream at the same rate which the stream is being sent to the receiver. More specifically, this invention involves computing and verifying a single digital signature on at least a portion of the stream. The properties of this single signature will propagate to the rest of the stream through ancillary information embedded in the rest of the stream.

**11 Claims, 13 Drawing Sheets**



US005991426A

**United States Patent [19]****Cox et al.****[11] Patent Number: 5,991,426****[45] Date of Patent: Nov. 23, 1999****[54] FIELD-BASED WATERMARK INSERTION AND DETECTION**

[75] Inventors: **Ingemar J. Cox**, Lawrenceville;  
**Matthew L. Miller**, Princeton, both of N.J.

[73] Assignee: **Signify, Inc.**, Princeton, N.J.

[21] Appl. No.: **09/216,499**

[22] Filed: **Dec. 18, 1998**

[51] Int. Cl.<sup>6</sup> ..... **G06K 9/00**

[52] U.S. Cl. ..... **382/100; 348/473**

[58] Field of Search ..... **382/100, 232; 380/7, 54; 348/473**

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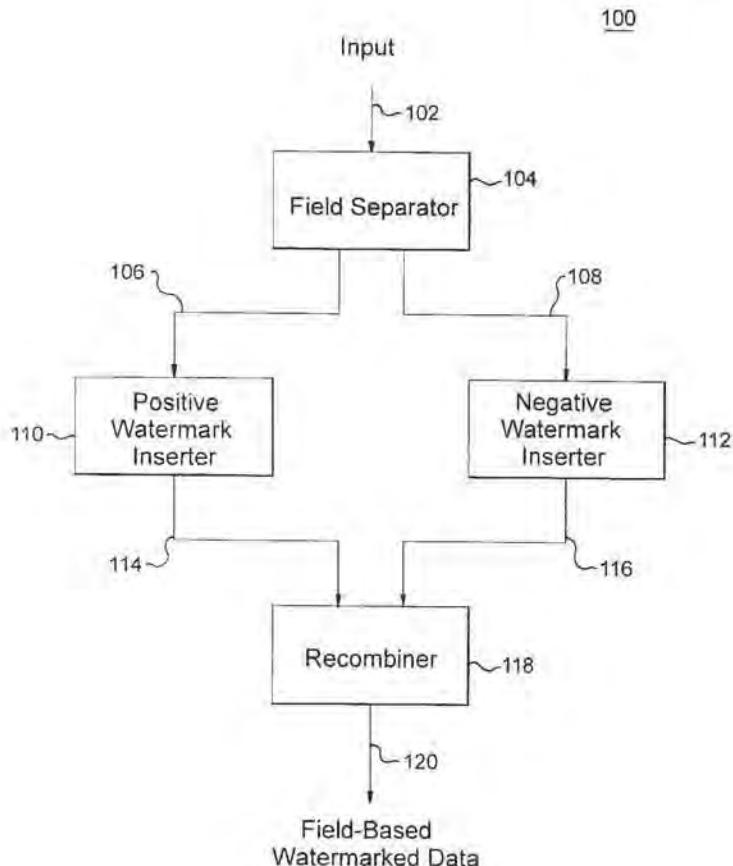
Hsu et al., "DCT-Based Watermarking for Video," *IEEE Transactions on Consumer Electronics*, vol. 44, No. 1, Feb. 1998, pp. 206-216.

*Primary Examiner*—Andrew W. Johns  
*Attorney, Agent, or Firm*—Scully, Scott Murphy & Presser

**[57] ABSTRACT**

A digital watermark is inserted into multimedia data containing two image fields by placing a positive watermark into a first field and a negative watermark into a second field. The positive watermark and negative watermark are opposite of one another. The two fields can be interlaced fields of a field-based video signal or alternate rows of a frame-based video signal. The watermark is extracted from field-based watermarked data by separating the watermarked data into two fields and subtracting one of the fields from the other field to generate a watermarked signal. The resultant watermarked signal is processed in a conventional manner to extract and detect the watermark.

**22 Claims, 6 Drawing Sheets**





US005940134A

**United States Patent [19]****Wirtz****Patent Number: 5,940,134****Date of Patent: Aug. 17, 1999**[54] **MARKING A VIDEO AND/OR AUDIO SIGNAL**[75] Inventor: **Gijssbrecht C. Wirtz**, Eindhoven, Netherlands[73] Assignee: **U.S. Philips Corporation**, New York, N.Y.[21] Appl. No.: **08/762,624**[22] Filed: **Dec. 9, 1996**[30] **Foreign Application Priority Data**

Dec. 11, 1995 [EP] European Pat. Off. .... 95203432

[51] **Int. Cl.<sup>6</sup>** ..... **H04N 7/08**[52] **U.S. Cl.** ..... **348/473; 386/94**[58] **Field of Search** ..... 348/571, 473, 348/474, 476, 486, 432, 434, 435, 436, 1; 380/5, 3; 455/2; 386/95, 94; H04N 7/08, 7/087[56] **References Cited**

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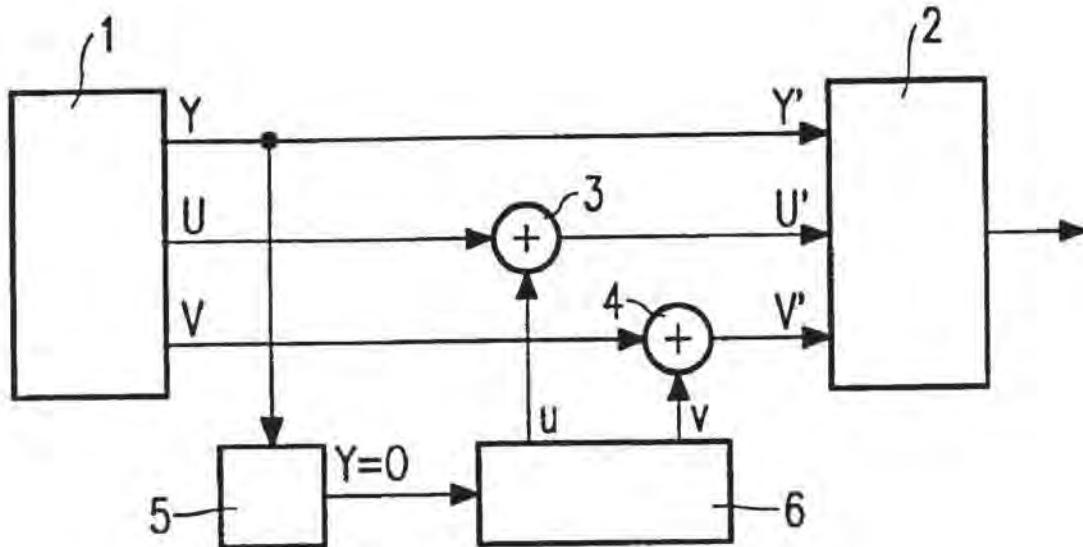
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5153637 6/1993 Japan ..... H04N 11/14

Primary Examiner—David E. Harvey  
Attorney, Agent, or Firm—Laurie E. Gathman[57] **ABSTRACT**

Method and arrangement for marking a video or audio signal to assign a classification to said signal, for example, to identify that the signal is authentic and may not be copied. The signal comprises at least two components (Y, UV) according to a predetermined standard (MPEG, PAL, NTSC). According to the invention, values are assigned to said components which in combination can normally not occur. For example, in black picture portions where Y, U and V are all zero, U and/or V are now wilfully made non-zero to constitute the watermark. Television receivers still display said black portion. The watermark is not lost when the signal is re-encoded and copied on a recordable disc. A player will not reproduce the copy because the watermark no longer corresponds with the "wobble key" of the new disc.

15 Claims, 1 Drawing Sheet





US005930369A

**United States Patent [19]****Cox et al.****Patent Number: 5,930,369****Date of Patent: Jul. 27, 1999****[54] SECURE SPREAD SPECTRUM  
WATERMARKING FOR MULTIMEDIA DATA**

[75] Inventors: **Ingemar J. Cox**, Lawrenceville; **Joseph J. Kilian**, Princeton Junction; **Talal G. Shamoon**, Princeton, all of N.J.

[73] Assignee: **NEC Research Institute, Inc.**, Princeton, N.J.

[21] Appl. No.: **08/926,720**[22] Filed: **Sep. 10, 1997****Related U.S. Application Data**

[63] Continuation of application No. 08/534,894, Sep. 28, 1995, abandoned.

[51] Int. Cl.<sup>6</sup> ..... **G09C 5/00**; H04L 9/00[52] U.S. Cl. ..... **380/54**; 380/3; 380/4;  
380/23; 380/55; 283/73; 283/113; 283/17[58] Field of Search ..... 380/3, 4, 9, 23,  
380/54, 59, 51, 55; 283/73, 113, 17, 901**[56] References Cited****U.S. PATENT DOCUMENTS**

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9520291	7/1995	WIPO .....
9621290	7/1996	WIPO .....
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9627259	9/1996	WIPO .....

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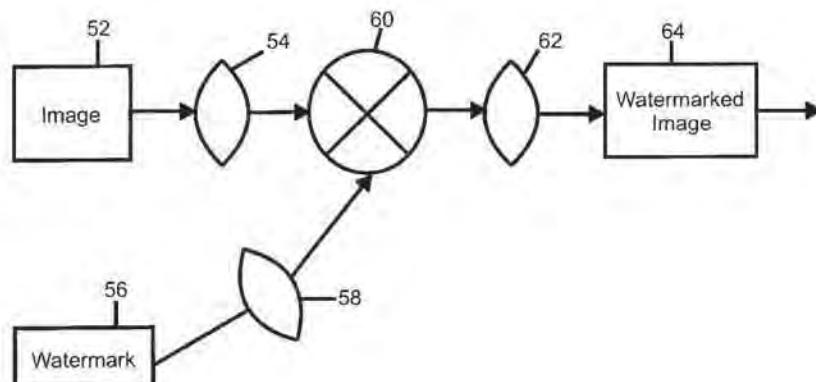
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(List continued on next page.)

*Primary Examiner—Bernarr E. Gregory  
Attorney, Agent, or Firm—Philip J. Feig***[57] ABSTRACT**

Digital watermarking of audio, image, video or multimedia data is achieved by inserting the watermark into the perceptually significant components of a decomposition of the data in a manner so as to be visually imperceptible. In a preferred method, a frequency spectral image of the data, preferably a Fourier transform of the data, is obtained. A watermark is inserted into perceptually significant components of the frequency spectral image. The resultant watermarked spectral image is subjected to an inverse transform to produce watermarked data. The watermark is extracted from watermarked data by first comparing the watermarked data with the original data to obtain an extracted watermark. Then, the original watermark, original data and the extracted watermark are compared to generate a watermark which is analyzed for authenticity of the watermark.

**46 Claims, 6 Drawing Sheets**



US005915027A

**United States Patent [19]****Cox et al.****Patent Number: 5,915,027****Date of Patent: Jun. 22, 1999****[54] DIGITAL WATERMARKING**

[75] Inventors: Ingemar J. Cox, Lawrenceville, N.J.;  
 Matthew L. Miller, Vilnius, Lithuania;  
 Kazuyoshi Tanaka; Yutaka Wakasu,  
 both of Tokyo, Japan

[73] Assignees: NEC Research Institute, Princeton,  
 N.J.; NEC Corporation, Tokyo, Japan

[21] Appl. No.: 08/746,022

[22] Filed: Nov. 5, 1996

[51] Int. Cl.<sup>6</sup> H04L 9/02

[52] U.S. Cl. 380/54

[58] Field of Search 388/28, 51, 54

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5,613,004	3/1997	Cooperman et al. ....	380/28
5,636,292	6/1997	Rhoads .....	382/232
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5,659,726	8/1997	Sanford, II .....	395/612
5,687,236	11/1997	Moskowitz et al. ....	380/28
5,734,752	3/1998	Knox .....	380/54

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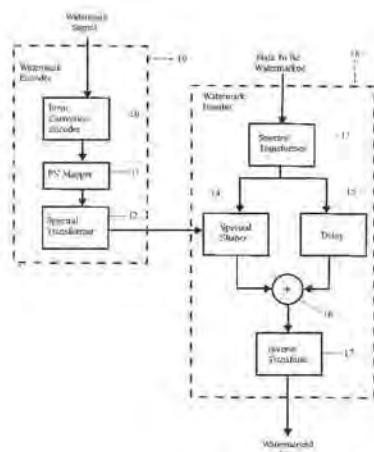
"Publish and Be Robbed?" New Scientist, Feb. 18, 1995, pp. 32-37.

(List continued on next page.)

*Primary Examiner—Salvatore Cangialosi  
 Attorney, Agent, or Firm—Philip J. Feig*

**[57] ABSTRACT**

Digital watermarking of data, including image, video and audio data, is performed by repeatedly inserting the watermark into subregions or subimages of the data. Similarly, the watermark is repeatedly extracted from the subregions of the data.

**28 Claims, 8 Drawing Sheets**



US005903721A

# United States Patent [19]

## Sixtus

[11] Patent Number: **5,903,721**  
 [45] Date of Patent: **May 11, 1999**

[54] **METHOD AND SYSTEM FOR SECURE ONLINE TRANSACTION PROCESSING**

[75] Inventor: **Timothy Sixtus, New York, N.Y.**

[73] Assignee: **cha!Technologies Services, Inc., New York, N.Y.**

[21] Appl. No.: **08/816,410**

[22] Filed: **Mar. 13, 1997**

[51] Int. Cl.<sup>6</sup> ..... **G06F 13/00**

[52] U.S. Cl. .... **395/187.01; 395/188.01**

[58] Field of Search ..... **395/188.01, 187.01, 395/186; 380/3, 4, 21, 23, 24, 25, 30**

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Primary Examiner—Joseph E. Palys

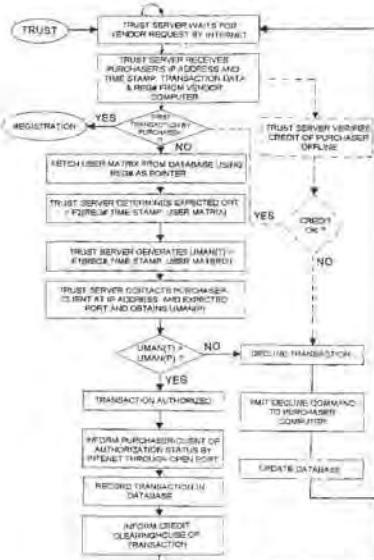
Assistant Examiner—Norman Michael Wright

Attorney, Agent, or Firm—Anthony R. Barkume

[57] **ABSTRACT**

A method for executing a secure online transaction between a vendor computer and a user computer, wherein the vendor computer and the user computer are interconnected to a computer network such as the Internet for data communications therebetween. The method comprises the steps of the user computer transmitting a transaction request message to the vendor computer via the computer network, the financial transaction request comprising user identification data unique to the user computer; in response to receiving the transaction request, the vendor computer sending a transaction verification request to a trust server computer interconnected to the computer network, the transaction verification request comprising the user identification data and data indicative of the requested transaction; in response to receiving the transaction verification request, the trust server computer authenticating the user computer by using the user identification data and communicating with the user computer for verification with the user identification data; and the trust server authorizing the transaction when the authenticating step has passed.

11 Claims, 10 Drawing Sheets





US005848155A

**United States Patent [19]****Cox****Patent Number: 5,848,155****Date of Patent: Dec. 8, 1998****[54] SPREAD SPECTRUM WATERMARK FOR EMBEDDED SIGNALLING****[75] Inventor: Ingemar J. Cox, Lawrenceville, N.J.****[73] Assignee: NEC Research Institute, Inc., Princeton, N.J.****[21] Appl. No.: 708,331****[22] Filed: Sep. 4, 1996****[51] Int. Cl.<sup>6</sup> H04L 9/00****[52] U.S. Cl. 380/4; 380/34****[58] Field of Search 380/4, 28, 34****[56] References Cited****U.S. PATENT DOCUMENTS**

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9621290	7/1996	WIPO .....
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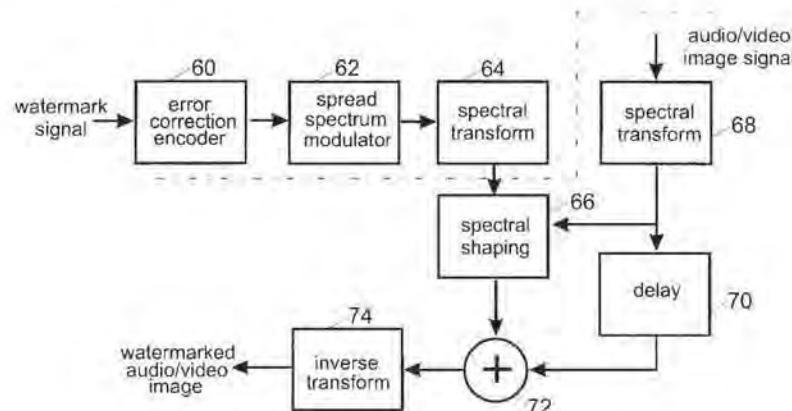
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*Primary Examiner—Salvatore Cangialosi  
Attorney, Agent, or Firm—Philip J. Feig*

**[57]****ABSTRACT**

A watermark is embedded into audio/video/image/multimedia data using spread spectrum methodology. The watermark is extracted from watermarked data without the use of an original or unwatermarked version of the data by using spatial or temporal local averaging of the frequency coefficients of the watermarked data.

**22 Claims, 9 Drawing Sheets**



US005799083A

**United States Patent** [19]  
Brothers et al.

[11] Patent Number: **5,799,083**  
[45] Date of Patent: **Aug. 25, 1998**

## [54] EVENT VERIFICATION SYSTEM

[76] Inventors: **Harlan Jay Brothers**, 103 Island View Ter., Branford, Conn. 06405; **Chris Hind Genly**, 2137 17th Ave., Forest Grove, Oreg. 97116

[21] Appl. No.: **702,815**[22] Filed: **Aug. 26, 1996**[51] Int. Cl.<sup>6</sup> ..... **H04L 9/00**[52] U.S. Cl. ..... **380/20; 380/23**[58] Field of Search ..... **380/9, 10, 20,  
380/23, 49**

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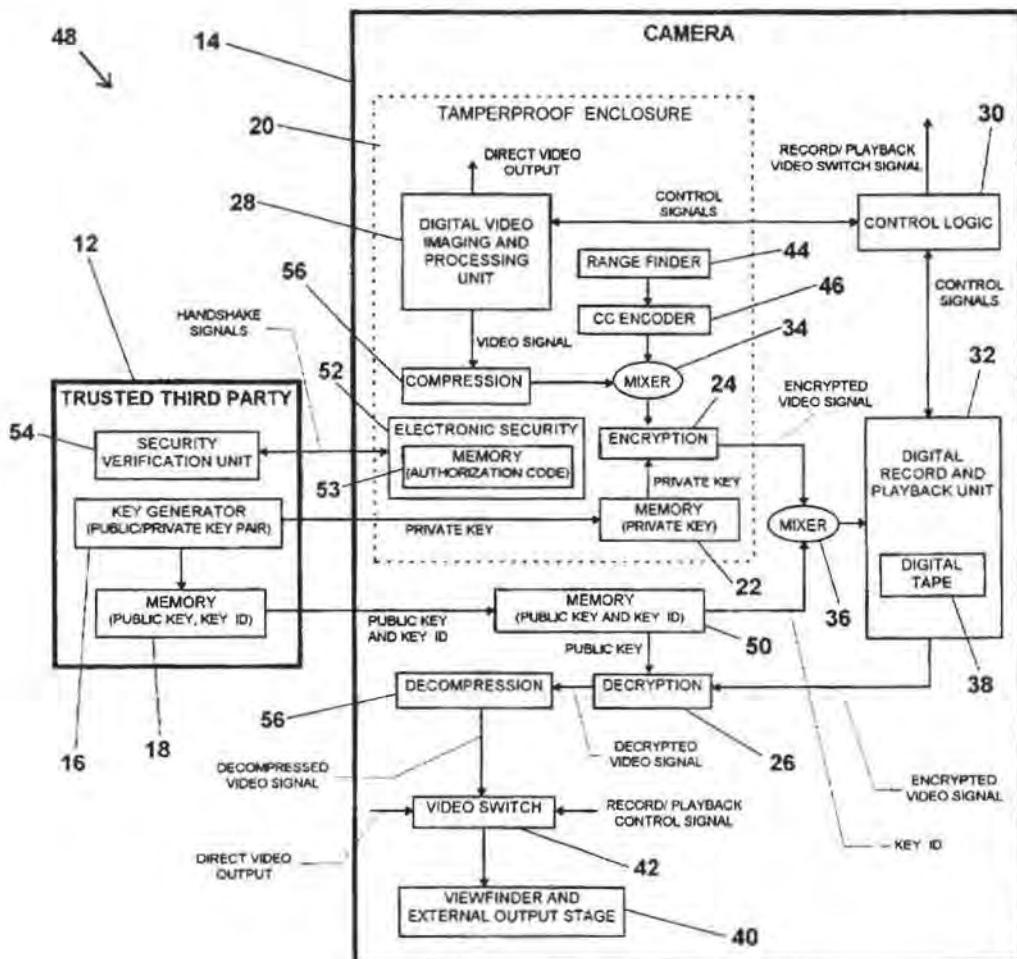
Primary Examiner—David C. Cain

Attorney, Agent, or Firm—Robert L. Tucker, Esq.

## [57] ABSTRACT

An event verification system comprises an input for the reception of information and an encryption algorithm to encrypt the information; an electronic recorder to record the encrypted information and a decryption algorithm to decrypt recorded information; at least one programmable memory to store at least one cryptographic key for use with the encryption and decryption algorithms; a tamperproof enclosure to protect the input and at least one programmable memory from access or alteration; and, a trusted agent to generate at least one cryptographic key to be used in conjunction with the encryption and decryption algorithms, the trusted agent programming any generated cryptographic key into at least one programmable memory for use with the encryption and decryption algorithms and, upon request, verifying the authenticity of the recorded information by decrypting the recorded information using at least one cryptographic key.

19 Claims, 5 Drawing Sheets



US005737416A

**United States Patent [19]**

[11] Patent Number: 5,737,416  
[45] Date of Patent: Apr. 7, 1998

- [54] METHOD AND APPARATUS FOR ENABLING TRIAL PERIOD USE OF SOFTWARE PRODUCTS: METHOD AND APPARATUS FOR UTILIZING A DECRYPTION STUB

- [75] Inventors: **Thomas Edward Cooper**, Louisville;  
**Hudson Wayne Phillips**, Boulder;  
**Robert Franklin Pryor**, Longmont, all  
of Colo.

- [73] Assignee: International Business Machines Corporation, Armonk, N.Y.

- [21] Appl. No.: 693,555

- [22] Filed: Aug. 2, 1996

#### **Related U.S. Application Data**

- [63] Continuation of Ser. No. 235,033, Apr. 25, 1994, abandoned.

- [51] Int. Cl.<sup>6</sup> ..... H04L 9/00  
[52] U.S. Cl. ..... 380/4; 380/9; 380/23;  
380/25; 380/49; 380/50; 395/186; 395/427;  
395/481; 395/490; 395/491

- [58] **Field of Search** ..... 380/4, 9, 21, 23,  
380/25, 49, 50; 395/601, 616, 186, 427,  
481, 490, 491, 726, 728

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0 561 685 A3	9/1993	European Pat. Off.	.....	G06F 12/14
0 598 587 A1	5/1994	European Pat. Off.	.....	G06F 1/00
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2 136 175	9/1984	United Kingdom	.....	H03K 13/24
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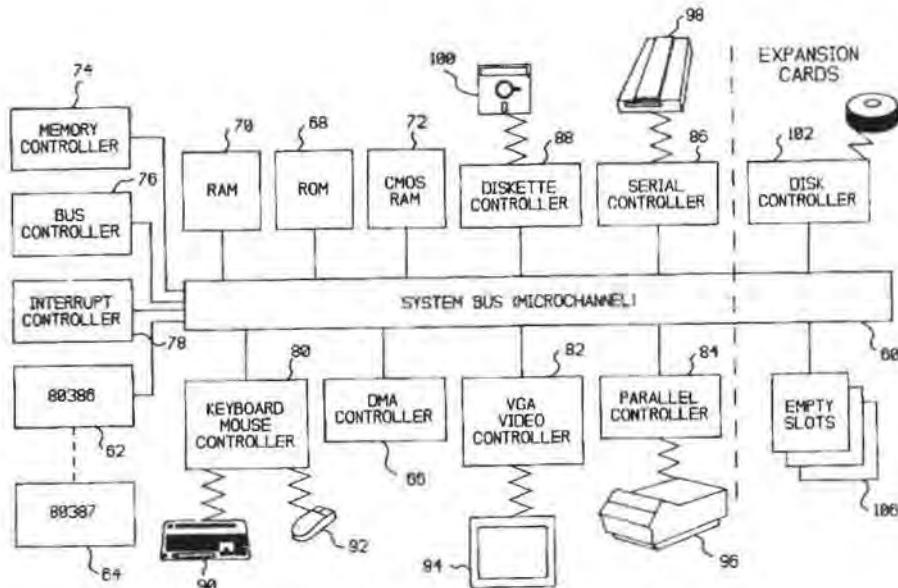
"Information Distribution via Rom Disks" (IBM Technical Disclosure Bulletin, vol. 33 No. 12, May 1991).

*Primary Examiner*—Bernarr E. Gregory  
*Attorney, Agent, or Firm*—Edward H. Duffield; Andrew J. Dillon

[57] ABSTRACT

A method and apparatus is provided in a data processing system for securing access to particular files which are stored in a computer-accessible memory media. A file management program is provided as an operating system component of the data processing system. At least one encrypted file and at least one unencrypted file are stored in the computer-accessible memory media. An unencrypted security stub is associated with each of the encrypted files. The security stub is at least partially composed of executable code. The file management program is utilized to monitor data processing calls for a called file stored in the computer-accessible memory media. The file management program determines what the called file has an associated unencrypted security stub. The called file is processed in a particular manner dependent upon whether or not the called file has an associated unencrypted security stub.

**22 Claims, 28 Drawing Sheets**



US005734752A

**United States Patent** [19]  
**Knox**

[11] **Patent Number:** **5,734,752**  
[45] **Date of Patent:** **Mar. 31, 1998**

[54] **DIGITAL WATERMARKING USING STOCHASTIC SCREEN PATTERNS**

[75] Inventor: **Keith T. Knox**, Rochester, N.Y.

[73] Assignee: **Xerox Corporation**, Stamford, Conn.

[21] Appl. No.: **719,235**

[22] Filed: **Sep. 24, 1996**

[51] **Int. Cl.<sup>6</sup>** ..... **G06K 9/74; H04N 1/405; H04N 1/52**

[52] **U.S. Cl.** ..... **382/212; 382/237; 358/536; 358/456; 380/54; 283/113**

[58] **Field of Search** ..... **382/219, 212, 382/218, 278, 283, 294; 380/6, 9, 18, 23, 54, 59, 51; 283/901, 113**

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| 5,396,559 | 3/1995  | McGrew        | ..... | 380/54  |
| 5,488,664 | 1/1996  | Shamir        | ..... | 380/54  |
| 5,583,950 | 12/1996 | Prokoski      | ..... | 382/212 |

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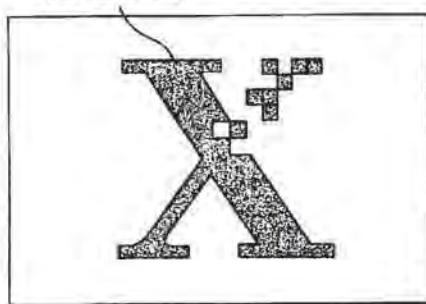
*Primary Examiner*—Scott Rogers  
*Attorney, Agent, or Firm*—Mark Costello

[57] **ABSTRACT**

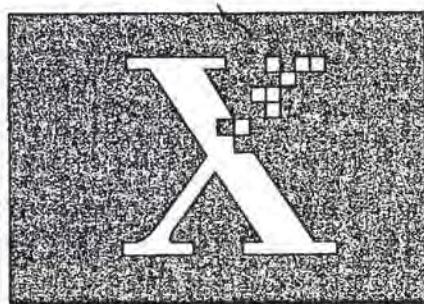
A method for generating watermarks in a digitally reproducible document which are substantially invisible when viewed including the steps of: (1) producing a first stochastic screen pattern suitable for reproducing a gray image on a document; (2) deriving at least one stochastic screen description that is related to said first pattern; (3) producing a document containing the first stochastic screen; (4) producing a second document containing one or more of the stochastic screens in combination, whereby upon placing the first and second document in superposition relationship to allow viewing of both documents together, correlation between the first stochastic pattern on each document occurs everywhere within the documents where the first screen is used, and correlation does not occur where the area where the derived stochastic screens occur and the image placed therein using the derived stochastic screens becomes visible.

16 Claims, 4 Drawing Sheets

**Pattern #1**



**Pattern #2**



US005673316A

**United States Patent** [19]

Auerbach et al.

[11] Patent Number: **5,673,316**  
 [45] Date of Patent: **Sep. 30, 1997**

**[54] CREATION AND DISTRIBUTION OF CRYPTOGRAPHIC ENVELOPE**

5,553,143 9/1996 Ross et al. .... 380/25  
 5,586,186 12/1996 Yuval et al. .... 380/4

[75] Inventors: **Joshua Seth Auerbach**, Ridgefield,  
 Conn.; **Chee-Seng Chow**, Cupertino,  
 Calif.; **Marc Adam Kaplan**, Katonah,  
 N.Y.; **Jeffrey Charles Crigler**, McLean,  
 Va.

Primary Examiner—David C. Cain  
 Attorney, Agent, or Firm—Douglas W. Cameron

[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.

**[57] ABSTRACT**

[21] Appl. No.: **625,475**

[22] Filed: **Mar. 29, 1996**

[51] Int. Cl<sup>6</sup> ..... **H04L 9/00**

[52] U.S. Cl. ..... **380/4; 380/25**

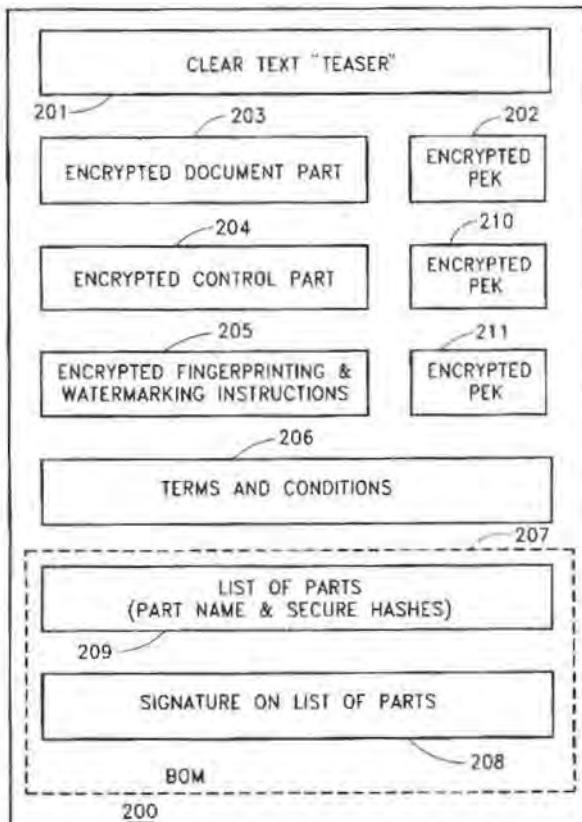
[58] Field of Search ..... **380/3, 4, 23, 24,  
 380/25, 28, 49**

**[56] References Cited****U.S. PATENT DOCUMENTS**

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5,394,469	2/1995 Nagel et al. ....	380/4
5,416,840	5/1995 Cane et al. ....	380/4
5,428,685	6/1995 Kadooka et al. ....	380/25
5,490,216	2/1996 Richardson ....	380/4
5,509,070	4/1996 Schull ....	380/4
5,530,752	6/1996 Rubin ....	380/4

A method and apparatus to create, distribute, sell and control access to digital documents using secure cryptographic envelopes. An envelope is an aggregation of information parts, where each of the parts to be protected are encrypted with a corresponding part encryption key. These encrypted information parts along with the other information parts become part of the envelope. Each part encryption key is also encrypted with a public key, and these encrypted part encryption keys are also included in the envelope. The envelope also includes a list of parts where each entry in the list has a part name and a secure hash of the named part. The list is then signed with a secret key to generate a signature, which is also included in the envelope. The signature can be verified using a second public key associated with first secret key, and the integrity of any information part in the envelope can be checked by computing a second hash and comparing it with the corresponding hash in the list of parts. Also, the information content of any encrypted part can only be recovered by knowledge of a second secret key corresponding to the public key that was used to encrypt the part encryption keys.

**8 Claims, 6 Drawing Sheets**



US005629980A

**United States Patent** [19]

Stefik et al.

[11] Patent Number: **5,629,980**  
 [45] Date of Patent: **May 13, 1997**

**[54] SYSTEM FOR CONTROLLING THE DISTRIBUTION AND USE OF DIGITAL WORKS**

[75] Inventors: **Mark J. Stefik**, Woodside; **Michalene M. Casey**, Morgan Hill, both of Calif.

[73] Assignee: **Xerox Corporation**, Stamford, Conn.

[21] Appl. No.: **344,042**

[22] Filed: **Nov. 23, 1994**

[51] Int. Cl.<sup>6</sup> ..... **H04L 9/00**

[52] U.S. Cl. ..... **380/4**

[58] Field of Search ..... **380/4; 235/380**

**[56] References Cited****U.S. PATENT DOCUMENTS**

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4,529,870	7/1985	Chaum	.....	235/380
4,658,093	4/1987	Hellman	.....	380/25
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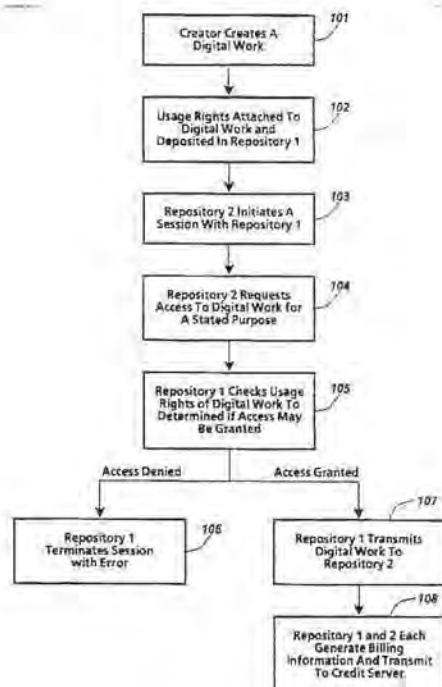
(List continued on next page.)

*Primary Examiner*—Salvatore Cangialosi

*Attorney, Agent, or Firm*—Richard B. Domingo

**[57] ABSTRACT**

A system for controlling use and distribution of digital works. In the present invention, the owner of a digital work attaches usage rights to that work. Usage rights are granted by the "owner" of a digital work to "buyers" of the digital work. The usage rights define how a digital work may be used and further distributed by the buyer. Each right has associated with it certain optional specifications which outline the conditions and fees upon which the right may be exercised. Digital works are stored in a repository. A repository will process each request to access a digital work by examining the corresponding usage rights. Digital work playback devices, coupled to the repository containing the work, are used to play, display or print the work. Access to digital works for the purposes of transporting between repositories (e.g. copying, borrowing or transfer) is carried out using a digital work transport protocol. Access to digital works for the purposes of replay by a digital work playback device (e.g. printing, displaying or executing) is carried out using a digital work playback protocol.

**31 Claims, 13 Drawing Sheets**

US005625690A

**United States Patent** [19]

Michel et al.

[11] Patent Number: **5,625,690**  
 [45] Date of Patent: **Apr. 29, 1997**

**[54] SOFTWARE PAY PER USE SYSTEM**

[75] Inventors: **Alan D. Michel**, Fishers; **Robert E. Reinke**, Indianapolis, both of Ind.

[73] Assignee: **Lucent Technologies Inc.**, Murray Hill, N.J.

[21] Appl. No.: **152,769**

[22] Filed: **Nov. 15, 1993**

[51] Int. Cl. <sup>6</sup> ..... **H04L 9/00**

[52] U.S. Cl. ..... **380/4; 380/21**

[58] Field of Search ..... **380/4, 21**

**[56] References Cited****U.S. PATENT DOCUMENTS**

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5,319,705	6/1994	Halter et al.	.....	380/4
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*Primary Examiner*—Salvatore Cangialosi  
*Attorney, Agent, or Firm*—Jeffrey M. Weinick; Donald P. Dinella

**[57] ABSTRACT**

A pay per use system for of the unauthorized use of computer software. An encryption program encodes original software to produce secured software. The encoding is accomplished by using cryptographic techniques. In order to use the software, a user must call a telephone number to receive the cryptographic keys necessary to decrypt the secured software. Thus, users must pay for each use of the secured software. The system allows software developers to freely distribute the secured software. Copies of the secured software may be freely made, because payment is based on each use of the software not on each copy of the software.

**25 Claims, 5 Drawing Sheets**

US005598470A

**United States Patent [19]**

Cooper et al.

[11] Patent Number: **5,598,470**  
 [45] Date of Patent: **Jan. 28, 1997**

[54] **METHOD AND APPARATUS FOR ENABLING TRIAL PERIOD USE OF SOFTWARE PRODUCTS: METHOD AND APPARATUS FOR UTILIZING A DECRYPTION BLOCK**

0601500A1 6/1994 European Pat. Off. .... G06F 1/00  
 2136175 9/1984 United Kingdom ..... H03K 13/24  
 WO94/07204 3/1994 WIPO ..... G06F 15/21

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[75] Inventors: Thomas E. Cooper, Louisville; Hudson W. Philips, Boulder; Robert F. Pryor, Longmont, all of Colo.

"Data Masking Algorithm" (IBM Technical Disclosure Bulletin, vol. 32 No. 68, Nov. 1989).  
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[73] Assignee: **International Business Machines Corporation, Armonk, N.Y.**

[21] Appl. No.: **235,031**

[22] Filed: **Apr. 25, 1994**

[51] Int. Cl.<sup>6</sup> ..... H04L 9/32; H04L 9/00

[52] U.S. Cl. ..... 380/4; 380/9; 380/23;  
 380/25; 380/49; 380/50

[58] Field of Search ..... 380/4, 25, 23,  
 380/9, 20, 49, 50

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5,166,886	11/1992	Molnar et al.	..... 364/479
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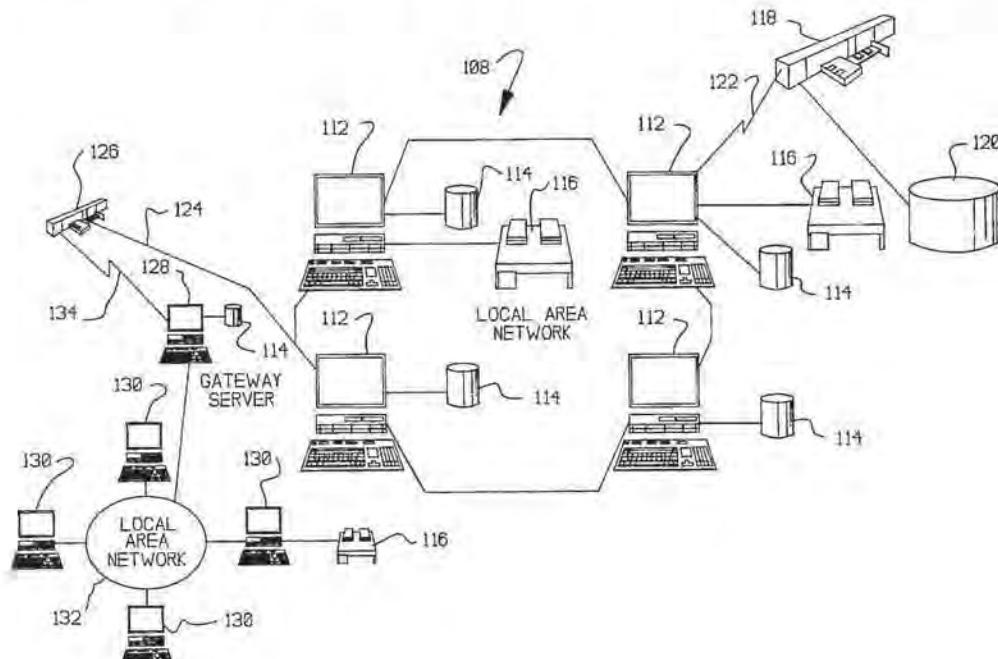
0268139A2	5/1988	European Pat. Off.	..... G06F 1/00
0268139A3	5/1988	European Pat. Off.	..... G06F 1/00
0561685A3	9/1993	European Pat. Off.	..... G06F 12/14
0561685A2	9/1993	European Pat. Off.	..... G06F 12/14
0598587A1	5/1994	European Pat. Off.	..... G06F 1/00

Primary Examiner—Bernarr E. Gregory  
 Attorney, Agent, or Firm—Edward H. Duffield; Barry J. Bumgardner; Andrew J. Dillon

**[57] ABSTRACT**

A method and apparatus is provided in a data processing system for securing access to particular files which are stored in a computer-accessible memory media. A file management program is provided as an operating system component of the data processing system. A plurality of files are stored in a computer-accessible memory media, including at least one encrypted file and at least one unencrypted file. For each encrypted file, a preselected portion of the file is recorded in memory, a decryption block is generated which includes information which can be utilized to decrypt the file, and the decryption block is incorporated in the file in lieu of the preselected portion which has been recorded in memory. Then, a file management program is utilized to monitor data processing system calls for files stored in the computer-accessible memory media. The file management program determines whether the called file has an associated decryption block. The called file is processed in a particular manner dependent upon whether or not the called file has an associated decryption block.

**8 Claims, 28 Drawing Sheets**



**United States Patent** [19]

Baugher et al.

[11] **Patent Number:** 5,581,703[45] **Date of Patent:** Dec. 3, 1996[54] **METHOD AND APPARATUS FOR RESERVING SYSTEM RESOURCES TO ASSURE QUALITY OF SERVICE**

[75] Inventors: **Mark J. Baugher; Philip Y. Chang,** both of Austin; **Gregory L. Morris,** Round Rock; **Alan P. Stephens,** Austin, all of Tex.

[73] Assignee: **International Business Machines Corporation,** Armonk, N.Y.

[21] Appl. No.: 84,053

[22] Filed: Jun. 29, 1993

[51] Int. Cl.<sup>6</sup> G06F 13/14

[52] U.S. Cl. 395/200.06; 395/200.12

[58] Field of Search 395/200, 650; 455/17; 370/60, 14, 45, 85.1, 85.7

[56] **References Cited**

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Primary Examiner—Thomas G. Black

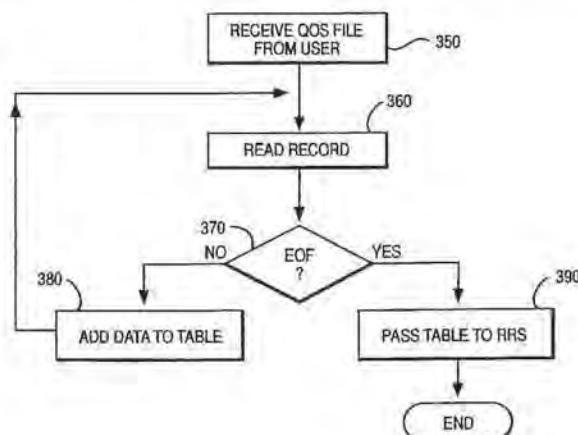
Assistant Examiner—Peter Y. Wang

Attorney, Agent, or Firm—Paul S. Drake; Volel Emile

[57] **ABSTRACT**

A method for providing files to a remote node including the steps of determining whether bandwidth is available for transmitting across a communications link a file requested by a remote node, reserving bandwidth for the requested file if bandwidth is determined to be available, and opening the requested file for transmission only if bandwidth is reserved. In addition, an apparatus for providing files to a remote node including apparatus for determining whether bandwidth is available for transmitting across a communications link a file requested by a remote node, apparatus for reserving bandwidth for the requested file if bandwidth is determined to be available, and apparatus for opening the requested file for transmission only if bandwidth is reserved.

12 Claims, 9 Drawing Sheets



**United States Patent [19]**

Lebrun et al.

[11] Patent Number: **5,548,579**  
 [45] Date of Patent: **Aug. 20, 1996**

**[54] SYSTEM FOR EFFECTIVE ALLOCATION OF NETWORK-WIDE BANDWIDTH**

5,461,611 10/1995 Drake, Jr. et al. .... 370/17  
 5,479,404 12/1995 Francois et al. .... 370/84

[75] Inventors: **Eric Lebrun, Saint Jeannet; Pascal Francois, Vence; Frederic Raimbault, Cagnes-Sur-Mer, all of France; Jeff Warren, Apex, N.C.**

Primary Examiner—Douglas W. Olms  
 Assistant Examiner—Ajit Patel  
 Attorney, Agent, or Firm—Gerald R. Woods

[73] Assignee: **International Business Machines Corporation, Armonk, N.Y.**

[21] Appl. No.: **493,066**

[22] Filed: **Jun. 21, 1995**

**[30] Foreign Application Priority Data**

Jun. 23, 1994 [EP] European Pat. Off. .... 94109763

[51] Int. Cl.<sup>6</sup> ..... H04L 1/22

[52] U.S. Cl. ..... 370/16

[58] Field of Search ..... 370/85.1, 84, 85.4,  
 370/85.5, 85.13, 85.14, 85.15, 16, 16.1,  
 17, 118, 58.3; 340/825.05, 827; 395/181,  
 182.02, 182.01, 182.08, 182.09

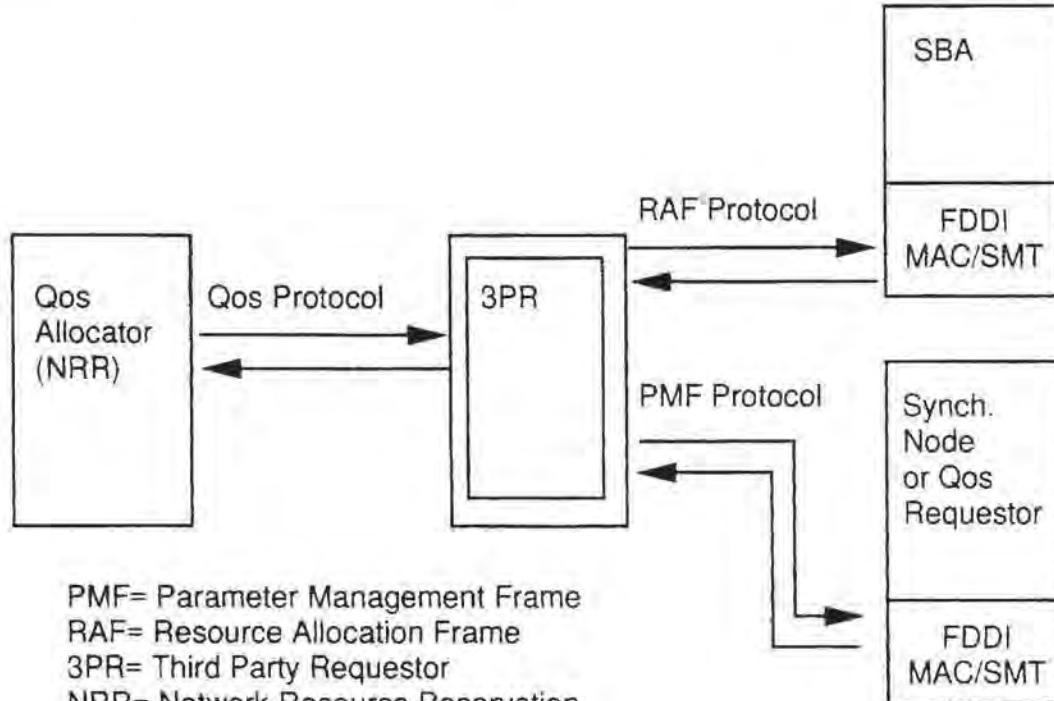
**[57] ABSTRACT**

To address Quality of Service (QoS) requirements in a domain of Local Area Networks(LANs) interconnected by at least one FDDI segment, network-wide bandwidth allocation is improved by a high availability Third Party Requestor (3PR). The 3PR receives from the QoS Allocator all information that it needs to ask for bandwidth reservation on the FDDI segment. Following a Station Management standard, the 3PR is able to act on behalf of an FDDI station that will submit synchronous traffic and ask for bandwidth allocation to a Synchronous Bandwidth Allocator (SBA). According to the SBA decision, the 3PR will then answer to the network-centralized QoS Allocator which will grant or deny the allocation over the whole path within the LAN domain. If for some reason, the acting SBA function moves to another station, the 3PR at the new station will become active.

**[56] References Cited****U.S. PATENT DOCUMENTS**

5,136,581 8/1992 Myehycke ..... 370/58.1

3 Claims, 9 Drawing Sheets





US005530759A

**United States Patent** [19]**Braudaway et al.**[11] **Patent Number:** **5,530,759**[45] **Date of Patent:** **Jun. 25, 1996**[54] **COLOR CORRECT DIGITAL  
WATERMARKING OF IMAGES**

5,363,212 11/1994 Taniuchi et al. .... 358/452  
 5,426,710 6/1995 Suzuki et al. .... 382/135  
 5,434,649 7/1995 Hasuo et al. .... 355/201

[75] Inventors: **Gordon W. Braudaway**, Yorktown Heights; **Karen A. Magerlein**, Ossining; **Frederick C. Mintzer**, Shrub Oak, all of N.Y.

[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.

[21] Appl. No.: **381,807****OTHER PUBLICATIONS**

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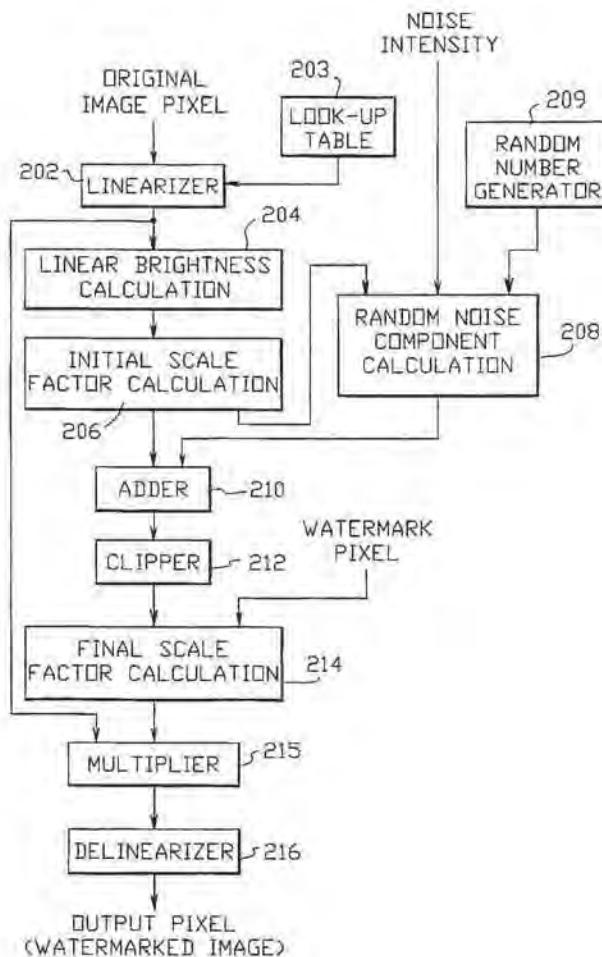
K. B. Benson, ed., "Television Engineering Handbook", McGraw-Hill Book Company, New York 1986.

[22] Filed: **Feb. 1, 1995***Primary Examiner*—David C. Cain*Attorney, Agent, or Firm*—Richard M. Ludwin[51] **Int. Cl.<sup>6</sup>** ..... **H04K 1/00****[57] ABSTRACT**[52] **U.S. Cl.** ..... **380/54; 580/3; 580/4;  
382/137; 355/201**

A system for placing a visible "watermark" on a digital image is disclosed, wherein an image of the watermark is combined with the digital image. The pixels of the watermark image are examined, and for each pixel whose value is not a specified "transparent" value, the corresponding pixel of the original image is modified by changing its brightness but its chromaticities. This results in a visible mark which allows the contents of the image to be viewed clearly, but which discourages unauthorized use of the image.

[58] **Field of Search** ..... **380/3, 4, 54, 59;  
382/7; 355/201****[56] References Cited****12 Claims, 5 Drawing Sheets****U.S. PATENT DOCUMENTS**

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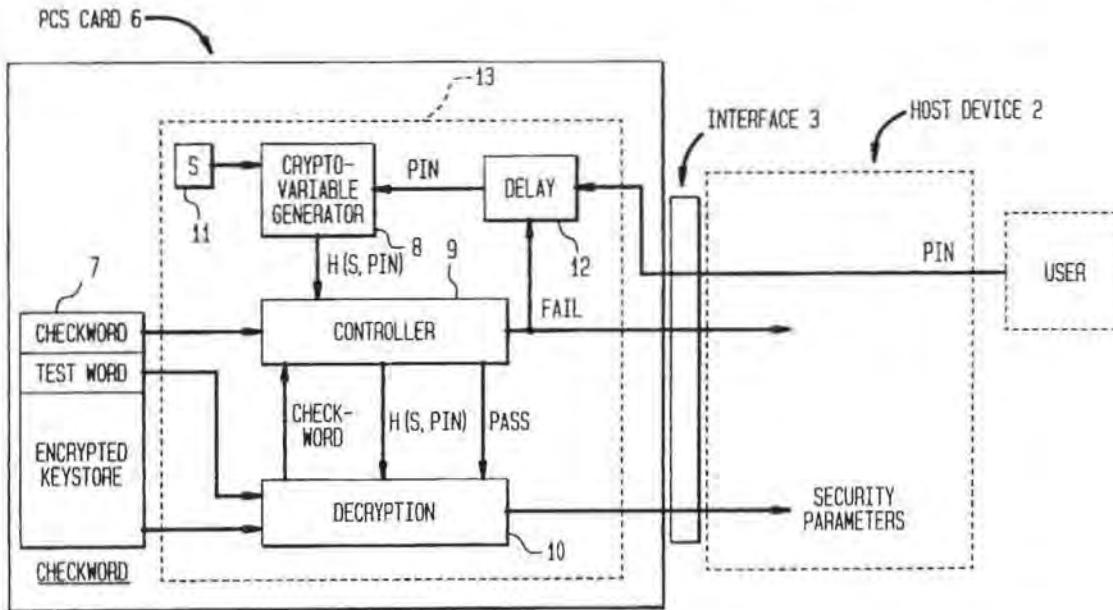
US005513261A

**United States Patent [19]****Maher****Patent Number: 5,513,261****Date of Patent: Apr. 30, 1996****[54] KEY MANAGEMENT SCHEME FOR USE WITH ELECTRONIC CARDS**4,763,419 4/1988 Roe ..... 380/23 X  
4,969,188 11/1990 Schöbi ..... 380/23**[75] Inventor:** David P. Maher, Windham, N.H.*Primary Examiner*—Gilberto Barrón, Jr.**[73] Assignee:** AT&T Corp., Murray Hill, N.J.**[21] Appl. No.:** 175,027**[57]****ABSTRACT****[22] Filed:** Dec. 29, 1993

In an electronic card of the type for insertion into a host electronic device for providing to the host device security parameters pertaining to the rightful holder of the card, the security parameters are stored in encrypted form to preclude their discovery by unauthorized parties. The decryption mechanism resists probing by unauthorized parties.

**[51] Int. Cl.<sup>5</sup>** H04L 9/32; G07F 7/10**[52] U.S. Cl.** 380/23; 380/24; 380/25;  
235/380**[58] Field of Search** 380/23-25; 235/380**[56] References Cited****U.S. PATENT DOCUMENTS**

4,672,182 6/1987 Hirokawa ..... 235/380

**6 Claims, 2 Drawing Sheets**



US005497419A

# United States Patent [19]

Hill

[11] Patent Number: 5,497,419  
 [45] Date of Patent: Mar. 5, 1996

[54] METHOD AND APPARATUS FOR RECORDING SENSOR DATA

[75] Inventor: Brian R. Hill, Los Angeles, Calif.

[73] Assignee: Prima Facie, Inc., Conshohocken, Pa.

[21] Appl. No.: 229,602

[22] Filed: Apr. 19, 1994

[51] Int. Cl. 6 H04L 9/00

[52] U.S. Cl. 380/9; 380/25; 380/30;

380/49

[58] Field of Search 380/9, 23-25,  
380/30, 49

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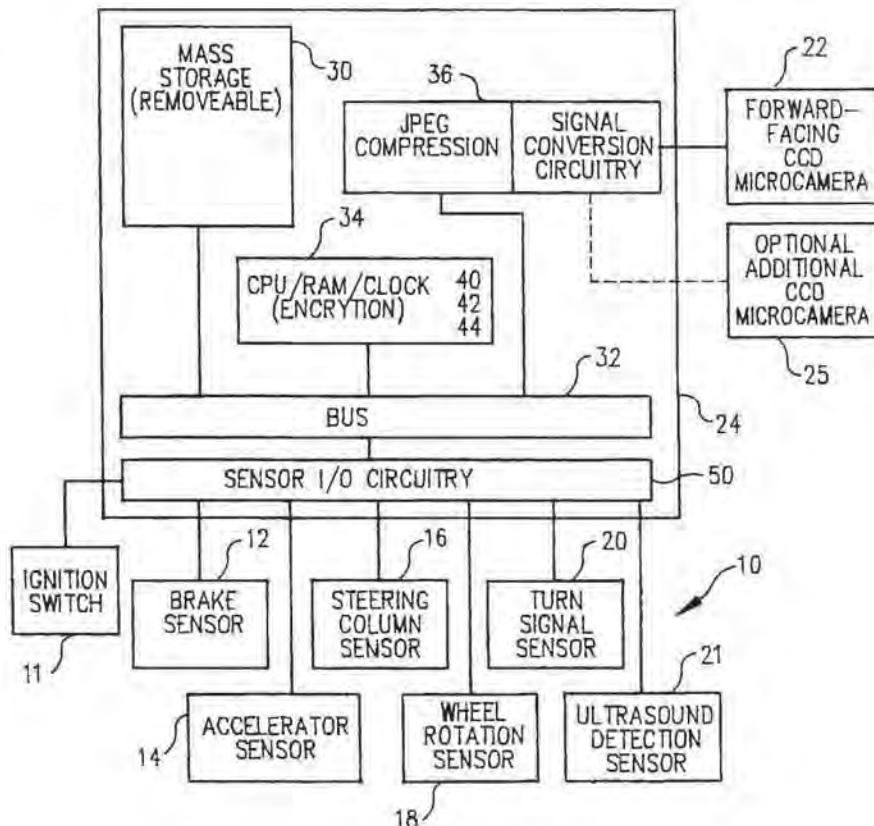
Don Clark, "Norris Plans to Launch Digital Recorder Using Flash Memory Chips From Intel", *The Wall Street Journal*, Mar. 28, 1994.

Primary Examiner—Salvatore Cangialosi  
 Attorney, Agent, or Firm—Robert M. Storwick

[57] ABSTRACT

A method and apparatus for recording sensor data. The analog and digital signals containing the sensor data are accompanied by a concurrent analog video signal. The analog signals are converted to digital form and highly redundant signals are compressed according to conventional compression techniques. The resulting compressed and uncompressed signals are encrypted and stored on a removable hard disk. The data stored on the removable hard disk can later be played back to reconstruct the original signals while assuring that the played back signals are correct reconstructions of the original signals.

24 Claims, 4 Drawing Sheets





US005379345A

**United States Patent [19]**

Greenberg

[11] Patent Number: **5,379,345**[45] Date of Patent: **Jan. 3, 1995**

[54] **METHOD AND APPARATUS FOR THE PROCESSING OF ENCODED DATA IN CONJUNCTION WITH AN AUDIO BROADCAST**

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[75] Inventor: **Burton L. Greenberg, New York, N.Y.**

*Primary Examiner—Bernarr E. Gregory  
Attorney, Agent, or Firm—Schweitzer Cornman & Gross*

[73] Assignee: **Radio Audit Systems, Inc., Peekskill, N.Y.**

[21] Appl. No.: **11,209**

[22] Filed: **Jan. 29, 1993**

[51] Int. Cl.<sup>6</sup> ..... **H04L 9/00**

[52] U.S. Cl. .... **380/23; 375/1;  
380/6; 380/20; 380/31; 380/34; 380/49;  
340/825.31; 340/825.34**

[58] Field of Search ..... **375/1; 380/34, 6, 20,  
380/23, 49, 50, 31, 33; 358/142-147;  
340/825.31, 825.34; 348/461-468, 473-486**

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[57] **ABSTRACT**

A method and apparatus for the identification and verification of audio transmission segments, such as may be broadcast by a radio station, consists of the generation of a data stream corresponding in duration to the length of the program segment and including both cumulative time data and segment identification data. The data stream is combined with the program segment to which it relates in a manner in which the data is inaudible on conventional reception apparatus and which does not significantly degrade the audio quality of the program segment. A reception facility is provided to extract the data stream from the recorded audio and compare the data therein with reference data for the transmission, including intended length and time of the segment. By such a comparison verification of the broadcast can be accomplished.

**16 Claims, 2 Drawing Sheets**

